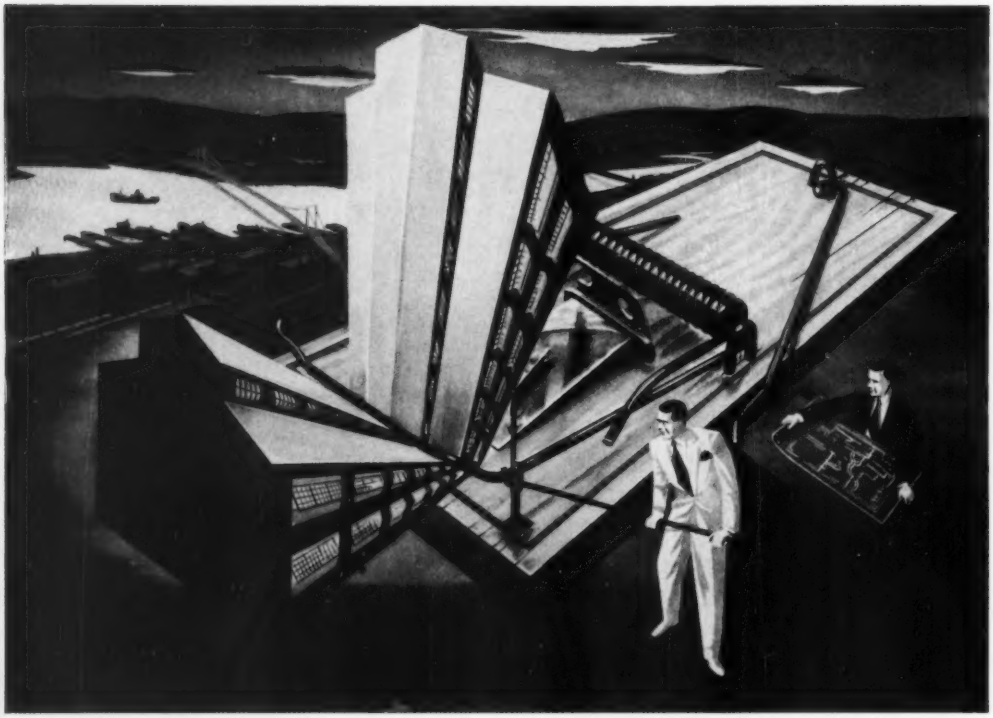
MODERN PLASTICS

MARCH 1951

To relieve pressure on plant capacity...



...use your custom molder's know-how

Higher production is being obtained in many fields of manufacture, not by increasing plant space, equipment, and manpower, but by assigning a share of the production load to custom molders of Durez plastics.

In enlisting the facilities of the molder you stand to gain in any or all of a number of ways. You may move up shipping dates... speed up the flow of parts to assembly lines... make your products safer, longer wearing, better looking, or less costly to produce.

Without adding to your own overhead, your custom molder brings into your picture a complete organization that, separate physically, works perfectly in a team with your own. Design cooperation, engineering, mold-making, and production in plastics are among his talents. Knowing the virtues of *all* the plastics, he knows which *one* will return you the most for your dollar on any assignment.

Through long experience, your molder has come to recognize the Durez phenolics as dependable and versatile "work-horses" of the plastics era. He has proven their mechanical, chemical, and electrical properties in twenty-eight years of successful use.

Make a habit of putting new problems to your plastics molder. Durez research and development facilities are at his service. . and yours... through Durez field engineers.

Our monthly "Durez Plastics News" will keep you informed on industry's uses of Durez. Ask us to send a copy regularly. Durez Plastics & Chemicals, Inc., 1203 Walck Road, North Tonawanda, N. Y.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB

Catalin STYRENE

Transforms Housewares into Home favorites

Remember the old fashioned bins for tea, sugar, flour, etc.? You'd usually find them hidden from view, stowed away in the pantry behind closed doors!

Today it's quite different . . . as the picture of the new LOOK* shelf-service canisters indicates. These are molded of CATALIN STYRENE in bright, cheerful kitchen colors. No bushel hides their light! Not only are they welcome, out-in-the-open show pieces but they also offer exceptional utility values and appreciated handling features. Note the transparent CATALIN STYRENE visual-inventory windows . . . a glance keeps a watchful check on the contents.

So many housewares, thru the use of CATALIN STYRENE, have been transformed into home favorites that we share the satisfaction the manufacturer enjoys from each new, ingeniously designed, skilfully molded and successfully marketed application.

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE, NEW YORK 16, NEW YORK

*Molded for Jonetware Company by The Lakone Co., 500 Rathbone Ave., Aurora, Ill.

MODERN PLASTICS*

VOLUME 28 MARCH 1951 NUMBER 7

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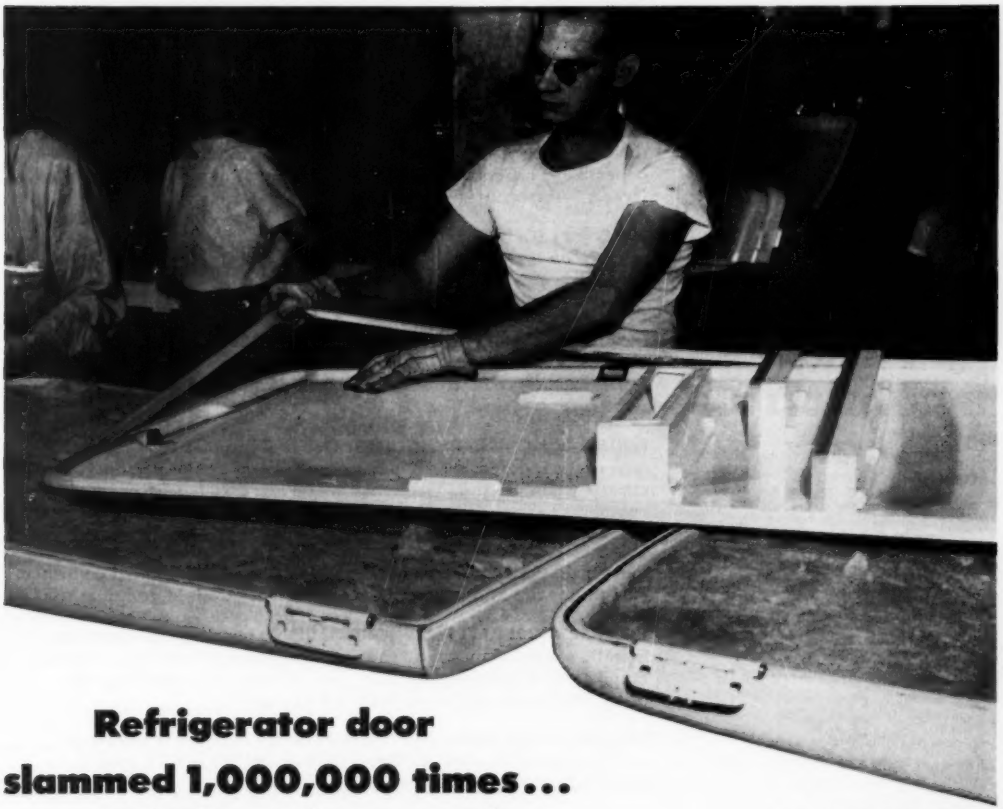
* Reg. U.S. Pat. Office.

Another new development using

B. F. Goodrich Chemical Company *raw materials*



Refrigerator door slammed 1,000,000 times... *gasket good as new!*

B. F. Goodrich Chemical Co. does not make this gasket. We supply raw materials only.

WHEN it comes to taking a beating, Geon plastic wins hands down! As a gasket for a refrigerator door it performs brilliantly.

Here's how tough it is! After 1,000,000 test openings and closings of a refrigerator door, the Geon gasket showed no wear and tear. This gasket took the same punishment as one would in home use for over 27 years, if the door were opened and closed 100 times a day!

You can figure easily what Geon does towards slashing gasket replacement cost, and helping improve refrigerator efficiency.

Long wear is only one of the advantages of Geon plastic over older types of gaskets. Previous materials, as they aged, tended to grow brittle and crack. Geon *stays* resilient under normal conditions. Again—the older types of gaskets were affected by solvents, greases, even hand perspiration. Geon has excellent resistance to these, and other damaging factors.

What Geon does here may point up its use for you—in developing or improving a product. For versatile Geon can be made resistant to heat and cold, aging and weather . . . to water, oil, grease, acids and alkalies.

Under present conditions, demand for Geon materials exceeds supply. However, limited quantities are available for development work. For technical bulletins and advice, write Dept. GA-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

FOR *DEPENDABLE* VOLUME PRODUCTION OF MOLDED PLASTICS PARTS

■ Are you planning the production of essential civilian goods . . . or material and equipment for national defense? If you are, consider molded plastics. In many instances nothing will do the job so well. In other cases, molded plastics may be used advantageously to replace certain materials in short supply.

But to realize the potential values of plastics for your critical applications, nothing is as important as choosing the right plastic molder . . . one who has the seasoned judgement to help you avoid the pitfalls of misapplications; the designing skill to help you get the most from your job; and the extensive facilities to insure dependable, economical, quality production of even your largest contracts or quantity runs.

That's why it's important, now more than ever, to place your reliance on top-flight molders . . . firms like Chicago Molded, who offers you advantages like these:

EXPERIENCE: More than 30 years devoted to custom work in plastics for many of the biggest names in industry who continue, year after year, to consider us a major source of supply. In addition, we have had broad experience in handling both prime-contract and sub-contract work during World War II.

ENGINEERING AND DESIGNING: Our staff includes top ranking men of the industry, many with more than 20 years of personal experience in plastics. These men will work closely with you and your engineers to insure a practical solution of your problems.

MOLD MAKING: We operate one of the largest and best equipped mold-making departments in the industry manned by skilled craftsmen. And those who know molding recognize CMPC mold design as tops.

COMPRESSION AND PLUNGER MOLDING: Our huge plant houses literally scores of automatic and semi-automatic presses in a complete range of sizes and types for every job. Included are giants capable of volume production of the largest parts made.

INJECTION MOLDING: Our Thermoplastics Division is equipped with dozens of the most modern injection machines with special emphasis on units of large capacity.

PLUS: A unique faculty for understanding our customers' needs . . . a "know-how" born of experience that insures a practical solution to the problem . . . a competence which is essential to successful plastics molding.

The services of our entire organization are available to you . . . now. If your engineering work is already completed, send us your prints for quotations. If your plans for essential production are still in the formative stage, a letter or phone call will bring a Chicago Molded engineer for consultation. He will gladly analyze your product to determine what, if any, molded plastics applications may be practical. And there's no obligation. Just write, wire or phone.

CHICAGO MOLDED PRODUCTS CORPORATION

1046 N. Kolmar Ave., Chicago 51, Illinois

Representatives in principal industrial centers

COMPRESSION, INJECTION AND PLUNGER MOLDING OF ALL PLASTIC MATERIALS

Mobilization's Challenge to Plastics

There are two major points of difference between industrial objectives in the present mobilization period and industrial objectives in a time of all-out war. In the first place, there is as yet a lack of the emotion of righteous wrath which makes men and women perform superhuman tasks while submitting to nauseous regulation. In the second place, the current defense program is to be paid for as far as possible out of taxes—current taxes.

This means that a high level of civilian production and enterprise must be maintained while, at the same time, priority is given to materials, machinery, and time for manufacture of war materiel.

From the standpoint of the Plastics Industry and the industrial users of plastics, this situation provides a challenge never before encountered—and an opportunity to attain new industrial stature.

Plastics were the "substitutes" of World War II. Today they are basic strategic materials in their own right and of as great significance in production for military use as any others. In civilian application so many products have been improved by redesign for plastics, so many products are being marketed that never could have been made out of any other materials, and public and trade acceptance of plastics is so universal that major dislocations in availability of plastics are being felt throughout the whole economy. Therein lies the challenge. First, it is up to every processor and user of plastics to study his output from a standpoint of validity of application. If he has any items of a marginal nature, he should replace them with plastics products of fundamental utility. And if his current sales pattern shows that a product based on a marginal application should be retained, then a non-plastic substitute should be considered.

Second, all molding, fabricating, and other processing activities should be closely studied with a view to cutting out waste—waste of materials, machine time, and man hours. Reject rates should be cut to the bone. Materials handling should be speeded up. Finishing should be organized so as to get more items through the line in less time. Scrap of any kind should be treated with covetous respect and used to the fullest advantage. Time-motion analyses and plant layout studies should be made with a view to improving per-man production.

Where the plastics items are components, the methods of assembly into final product should be analyzed with a view to eliminating loss either of material through breakage or time through awkwardness. Finally, equipment and production plants should be kept at peak efficiency because plastics plants are going to have a bigger job to do in the next few years than they had in the past.

That is the challenge: to make the most of the best with the materials, equipment, and manpower available; to maintain as big a civilian business as possible while taking on as many defense jobs as can be efficiently handled; to assure that civilian plastics applications are worthy and enduring from a market standpoint; to make a profit so the tax burden can be borne.

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Circulation Department
Circulation Manager: FREDERICK A. KLEIN
32 Broadway, New York 4, N. Y.
Tel., WHitehall 4-4782

Executive and Editorial Offices
575 Madison Ave., New York 22, N. Y.
Tel., PLaza 9-2710

Branch Offices
Chicago 1: 221 N. La Salle St.
J. M. Connors Tel., Financial 6-3450

Cleveland 14: 815 Superior Ave.
R. C. Beggs Tel., SUperior 1-0737

Los Angeles 17: 816 West Fifth St.
J. C. Galloway Tel., Mutual 8335

London, England:
L. H. Dolaro, 10/12 Broad St. Ave.,
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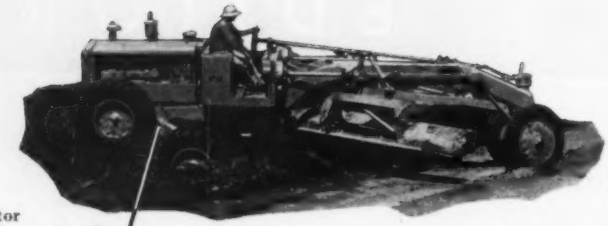
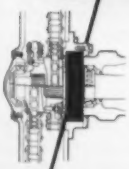


This rugged motor grader, made by Caterpillar Tractor Co., Peoria, Illinois, features a tandem-swing drive in its rear wheel design which gives it great traction and grade accommodation.



INSUROK

T-602

stands up where metals fail!

Graphited plastic laminate eliminates sleeve trouble in "Caterpillar" Motor Grader

On their Motor Grader tandem-drive housing pivot bearings, Caterpillar Tractor Co. experienced premature sleeve bearing wear. These bearings are subjected to intermittent oscillating motion and are difficult to lubricate. Field reports showed that metal sleeves became scored after only 300 to 600 hours of operation.

Richardson engineers recognized this as an ideal job for INSUROK, Grade T-602. In such difficult bearing applications, this self-lubricated graphitized phenolic laminate provides just the right combination of properties for long, trouble-free service. Result for "Caterpillar": three years of use—no trouble reports!

In hundreds of similar applications, laminated and molded INSUROK made by The Richardson Company are solving difficult problems for industry. Investigate these materials, today.

INSUROK*

Laminated and Molded Plastics

*Reg. U. S. Pat. Off.

The RICHARDSON COMPANY

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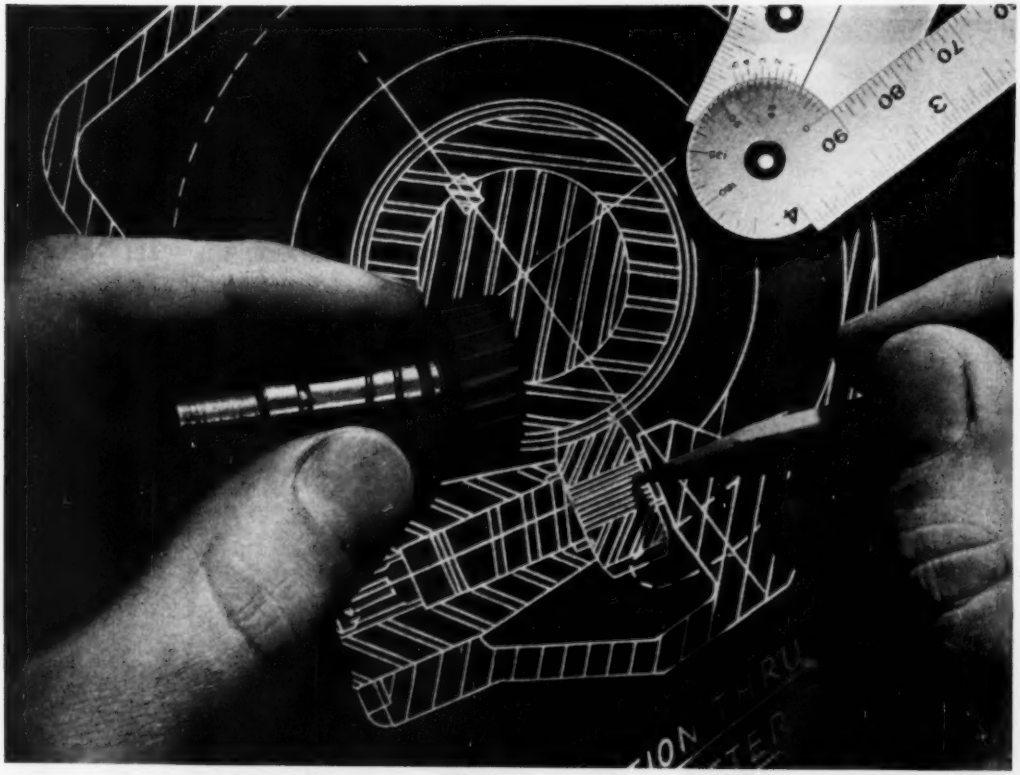

NYLON SPEEDOMETER GEAR ON '51 FORD REGISTERS 50% CUT IN PRODUCTION COSTS

Injection-molded to exacting tolerances in a single operation

Nylon door-lock wedge on 1951 Ford. Provides superior abrasion-resistance, high resistance to repeated impact of door slamming. Costs less than materials previously used. (Nylon part molded by Standard Products Co., St. Clair, Mich., and Quinn-Berry Corp., Erie, Pa.)

A five-step operation was formerly required to produce this gear to drive the Ford speedometer cable. Now, in a single operation, Ford injection-molds nylon gears, complete with tooth identification, directly on the shaft. It is estimated that use of Du Pont nylon has reduced the man-hours needed to produce this gear to one-half the former figure—a 50% saving in over-all production cost!

Nylon gears perform better, too. Ford finds that closer tolerences can be held more economically. Tolerances for the nylon gear are = 0.001″ for pitch diameter, and = 0.002″ for O.D. Too, nylon has superior wear- and abrasion-resistance. Rugged tests equivalent to 100,000 miles of operation at 80 m.p.h. proved nylon's ability to stand up without visible wear.

Demand for nylon currently exceeds supply. However, we suggest you evaluate its versatile properties for future application. We will gladly discuss the availability of experimental qualities for development work. For additional information, write:

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Dept., Sales Offices:
350 Fifth Ave., New York 1, N. Y.
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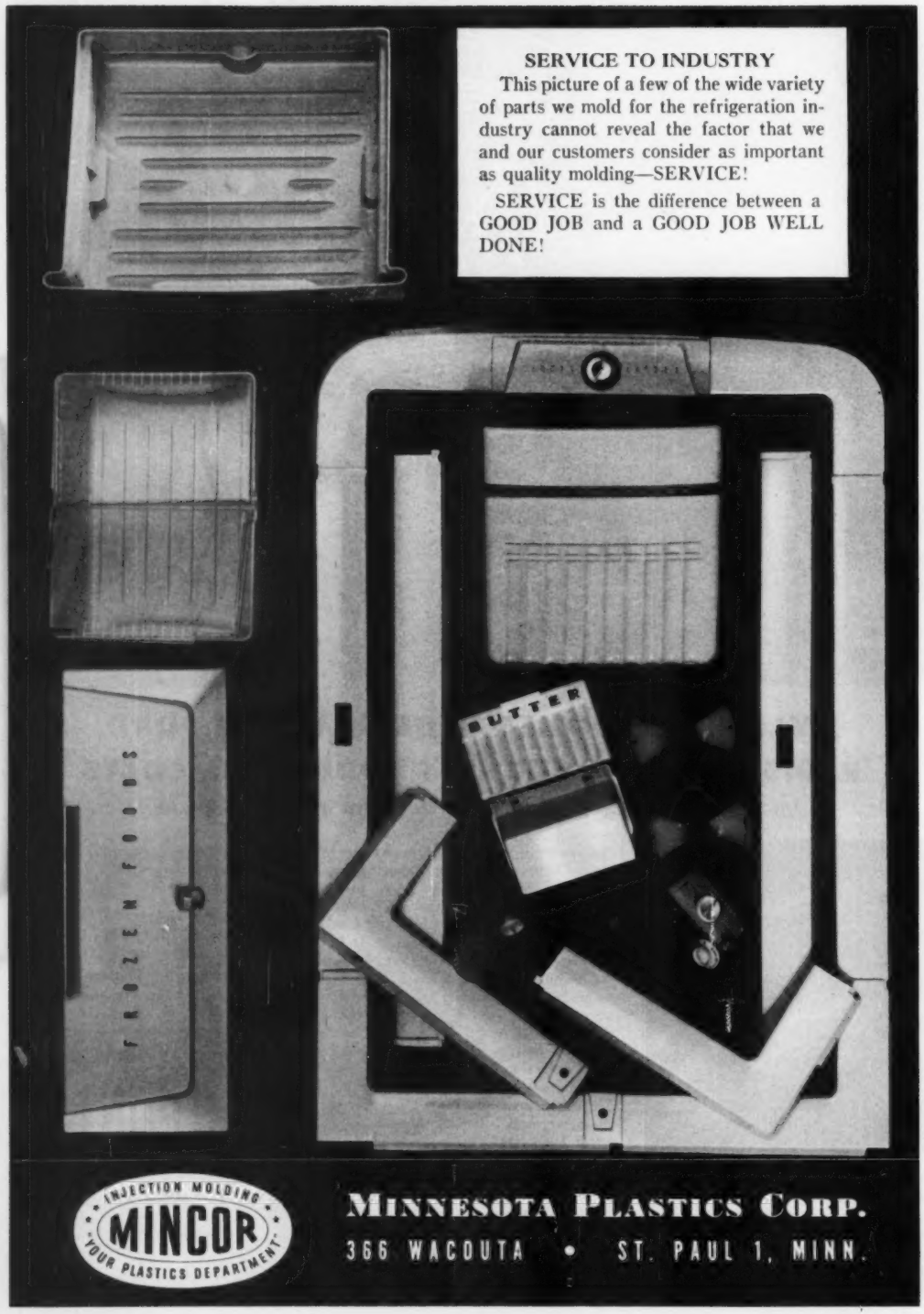
PLASTICS
Better things for Better Living
. . . through Chemistry


SERVICE TO INDUSTRY
This picture of a few of the wide variety of parts we mold for the refrigeration industry cannot reveal the factor that we and our customers consider as important as quality molding—SERVICE!
SERVICE is the difference between a GOOD JOB and a GOOD JOB WELL DONE!
FROZEN FOODS
BUTTER
INJECTION MOLDING
MINCOR
"YOUR PLASTICS DEPARTMENT"
MINNESOTA PLASTICS CORP.
366 WACOUTA • ST. PAUL 1, MINN.

Are you up-to-date on acetate?

What is your printed product—a greeting card, price marker, advertising calendar, playing cards, display? Celanese *acetate* sheeting should be first on your list for these and other printing applications.

Celanese acetate sheeting is low in cost. It is available in cut-to-size sheets or continuous lengths. This means additional economies in cutting. It is produced in a range of gauges from .003" in clear and colored transparents or body colors. Special I.P.I. inks that permit plate polishing after printing are now available.

When you print on plastic, keep Celanese *acetate* sheeting in mind. For specific information write to: Celanese Corporation of America, Plastics Division, Dept. 101-C, 180 Madison Ave., New York 16. In Canada, Canadian Cellulose Products, Limited, Montreal, Toronto.

*Reg. U. S. Pat. Off.

Celanese* PLASTICS

you can insure Best Production . . . with

GERING

MOLDING COMPOUNDS

in pellet form
all furnished

- POLYSTYRENE
- VINYL
- POLYETHYLENE
- CELLULOSE ACETATE
- ETHYL CELLULOSE

There's a Gering Thermoplastic for every need . . . no matter how tough the assignment . . . for Injection and Extrusion molding. Gering offers a superb selection of every known thermoplastic for Defense and Civilian uses, in standard and special compounds; guaranteeing uniform production of True Colors, Outstanding Quality, Faster Production Cycles, Less Rejects, Lower Costs.

Gering's Dependable

DRYCOL

for Quick on-the-spot coloring of CRYSTAL STYRENE

Saves production time and money, reduces rejects. Only Gering could have conceived and produced DRYCOL . . . the dependable dry color powder for in-your-plant use. Specify DRYCOL in any of 17 Bureau of Standards colors; or order special colors. DRYCOL is dust-free, compact, economical . . . in units to color 50 to 100 lbs. of styrene in any mixing drum . . . ready to mold. Send for free sample packet to color 100 lbs.

Gering's technical and research staffs are at your service at all times.

PLASTIC MATERIALS

GERING PRODUCTS, Inc.

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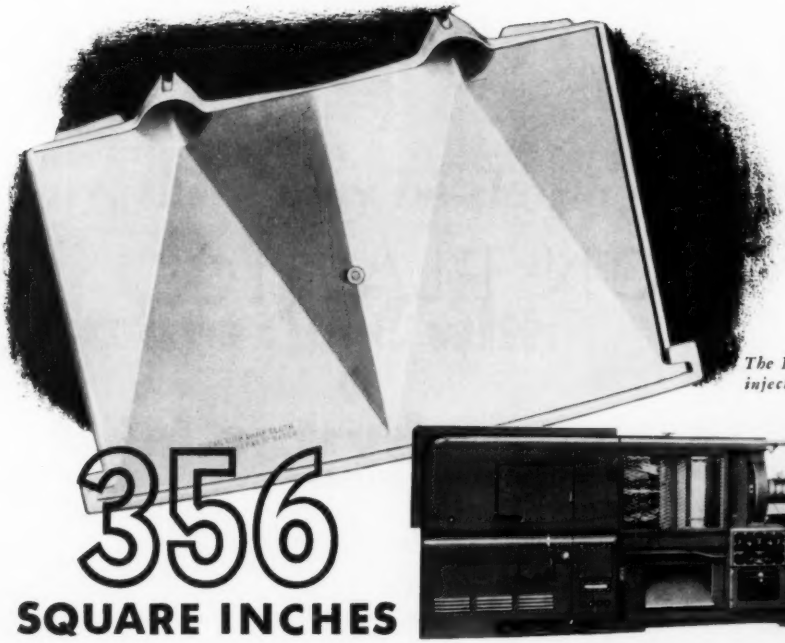


The 10H-32 Oz. Reed-Prentice injection molding machine.

356 SQUARE INCHES

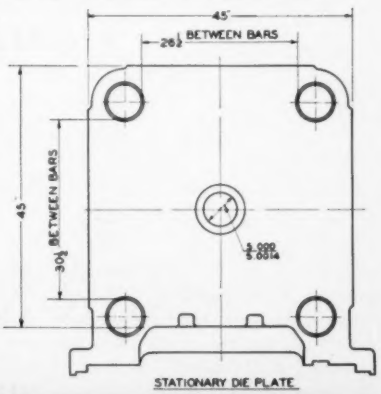
● This Westinghouse refrigerator section is being molded on a Reed-Prentice 10H-32 oz. injection machine by General Machine & Tool Works of Walled Lake, Michigan, one of the suppliers of parts for Westinghouse products.

The complete shot of polystyrene weighs 29 oz. and covers 356 square inches of the mold. The continuous production of this large plastic piece attests to the excellence of Reed-Prentice injection presses and their ability to give top performance.

And now the 10H-24 oz. and 32 oz. models with tie bar construction have been greatly improved to provide even more plasticizing capacity, larger stroke, larger (45-inch square) die plates and convenient working height of 50" from the floor to center of die.

SPECIFICATIONS:

	24 oz.	32 oz.
Die locking pressure, tons	600	600
Rated casting area, sq. in.	300	300
Mold Opens	24"	24"
Diameter of Tie Bars	6"	6"
Maximum Die Space	28"	28"
Size of die plates, (H x V)	45" x 45"	45" x 45"
Weight, approx.	35,000 lbs.	36,500 lbs.
Height from floor to die center	50"	50"



THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

REPRESENTATIVES:
Detroit ..... Kordenbrock Machinery Co.
Grand Rapids ..... Joseph Monahan Co.
Syracuse ..... J. F. Owens Machinery Co.
Houston ..... Preston Machine Tool Sales Co.
Seattle & Spokane ..... Star Machinery Co.
Minneapolis ..... Chas. W. Stone Co.
Portland, Ore. ..... Star Machinery Co.

INJECTION MACHINES
REED-PRENTICE CORP.
WORCESTER MASS., U.S.A.

MAIN OFFICE:
Worcester 4, Massachusetts

BRANCH OFFICES:
New York 6, N. Y.
Cleveland 13, Ohio
Chicago 12, Illinois
Los Angeles 58, Calif.

NIXON PLASTICS

Sheets • Rods • Tubes

cellulose acetate
cellulose nitrate
ethyl cellulose
cellulose acetate butyrate

Rigid Vinyl Sheeting

Molding Powder

cellulose acetate
ethyl cellulose

NIXON NITRATION WORKS

Founded 1898

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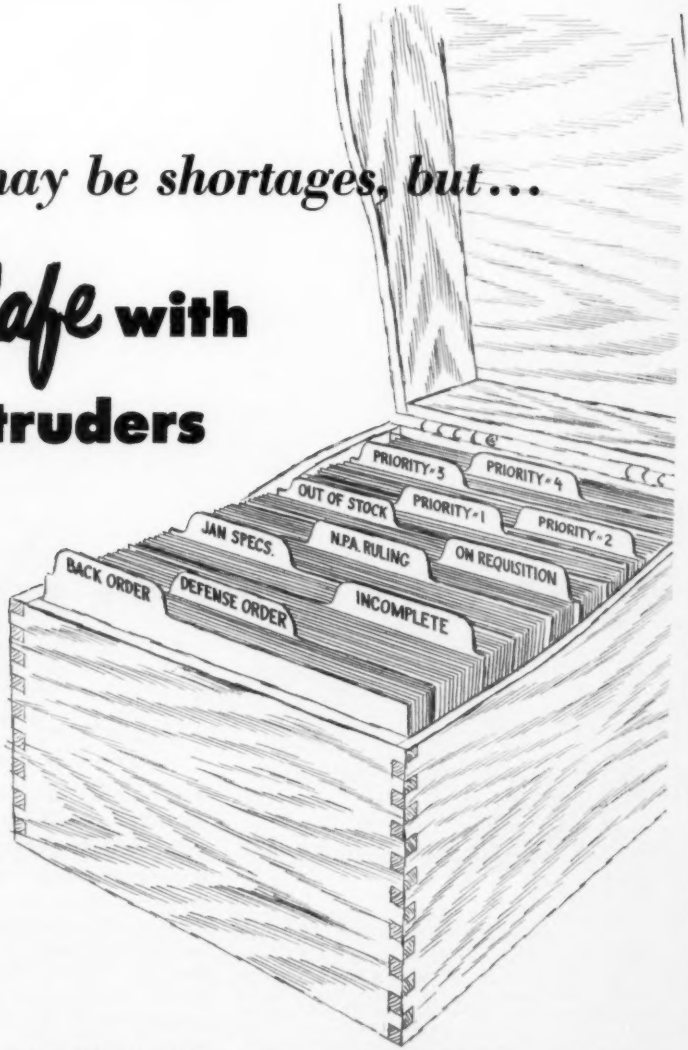
Sure, there may be shortages, but...

you are *Safe* with MPM extruders



Recent government restrictions have placed limits on the use of steel and other materials for non-defense manufacture, and it seems there is a good chance these regulations may soon be extended and tightened.

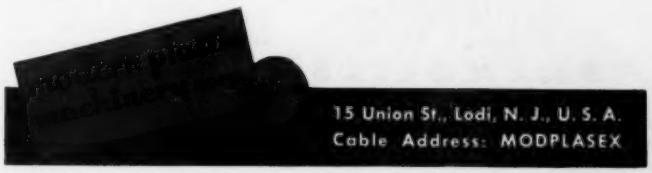
As a direct result, production of extrusion machines by MPM and other manufacturers will suffer limitation, and replacement parts may be short, also.

What's the point? It's this . . . If you own an MPM extruder, you are reasonably safe from worries about replacement parts.

MPM extruders are built to last. All parts which contact the plastic resins (and that includes hopper, cylinder, screw, die head) are built of solid corrosion-resistant metals. There is no chance of their wearing thin and losing usefulness because softer under-metals have become exposed.

And here's something else to consider — the wiring, the piping, the drive mechanisms of MPM extruders are designed with generous safety margins, so few, if any, difficulties arise through failure of these parts.

A Special Note: If you do not own extrusion equipment or if you are contemplating expansion of an existing installation, without delay, request details about MPM extruders and auxiliary equipment that will do your job . . . and will do it for a long time to come.



15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

which one's hiding the proper phenolic?

• No cost-conscious molder wants to play guessing games when selecting a phenolic molding material. The risks involved far outweigh the few pennies that might be saved.

For compression and transfer molding of pieces of all sizes, the use of Plenco Phenolics goes a long way towards eliminating guesswork. Molding and curing characteristics of the various grade Plenco Phenolics have been firmly established over the years and use of Plenco materials by so many leading molders attests to their unvarying high quality and satisfactory performance.

SPECIAL PURPOSE MATERIALS

Problems of heat resistance, impact resistance, controlled dielectric properties, and special flow characteristics for deep draw moldings can be met by specially compounded Plenco materials. These materials can be provided with the best balance of required characteristics to insure proper molding of any specific product.

Plenco Phenolics have undergone and passed comprehensive use-tests. The certainty molders express in their uniformity and excellence is the best recommendation we can offer. Ask yourself: Is it worthwhile to guess about the properties of the material you select? . . . The correct answer is obvious. Write us today concerning your requirements.

PLASTICS ENGINEERING CO.
Sheboygan, Wisconsin

PLENCO
PHENOLICS

. . . black, browns, mottles and colors in General Purpose, Heat Resisting and Medium Impact grades. Special Purpose Molding Compounds and Resins are produced to fulfill special molding requirements.

Inaugurating a new era in plastics molding

the new 300 oz.

Watson-Stillman Injection Molding Machine

DIE SPACE 48" x 72"... CLAMP 1500 TONS

NEW ECONOMY... NEW FLEXIBILITY

Significant evidence of Watson-Stillman's ability to anticipate and meet unusual requirements of plastics molders is the record-smashing 300-ounce Injection Machine . . . NOW—READY FOR YOU.

Fifty per cent larger than its largest predecessor, this latest-compact unit opens new vistas to every department of plastic products development. **For the designer:** larger integral moldings, heavier sections when needed, without taxing capacity. **For the production chief:** less operating expense and lower maintenance per pound, or unit, of product. **For top management:** greater PROFITS, through broadened scope of facilities, improved competitive position, and all the other advantages naturally attendant upon increased unit capacity and greater over-all production.

This machine, like others in the W-S COMPLETELINE, was developed to meet existing needs of the industry. Whether you mold one ounce or fifteen pounds, and, whether you need INJECTION, TRANSFER or COMPRESSION Molding Machines, you will find the most efficient, economical, and profitable answer to your equipment needs through the close integration of Watson-Stillman's development and manufacturing facilities which always match the methods and markets of our fast-moving industry.

Remember—when planning plant expansion or a new business—consult W-S first about plastics machinery and how to use it.

WATSON-STILLMAN

HYDRAULIC MACHINERY DIVISION Estab. 1848 — Main Office, 150 Aldene Rd., Roselle, New Jersey
Branch Office: Chicago, Ill. Manufactured in Canada by — Canadian Vickers, Ltd., Montreal

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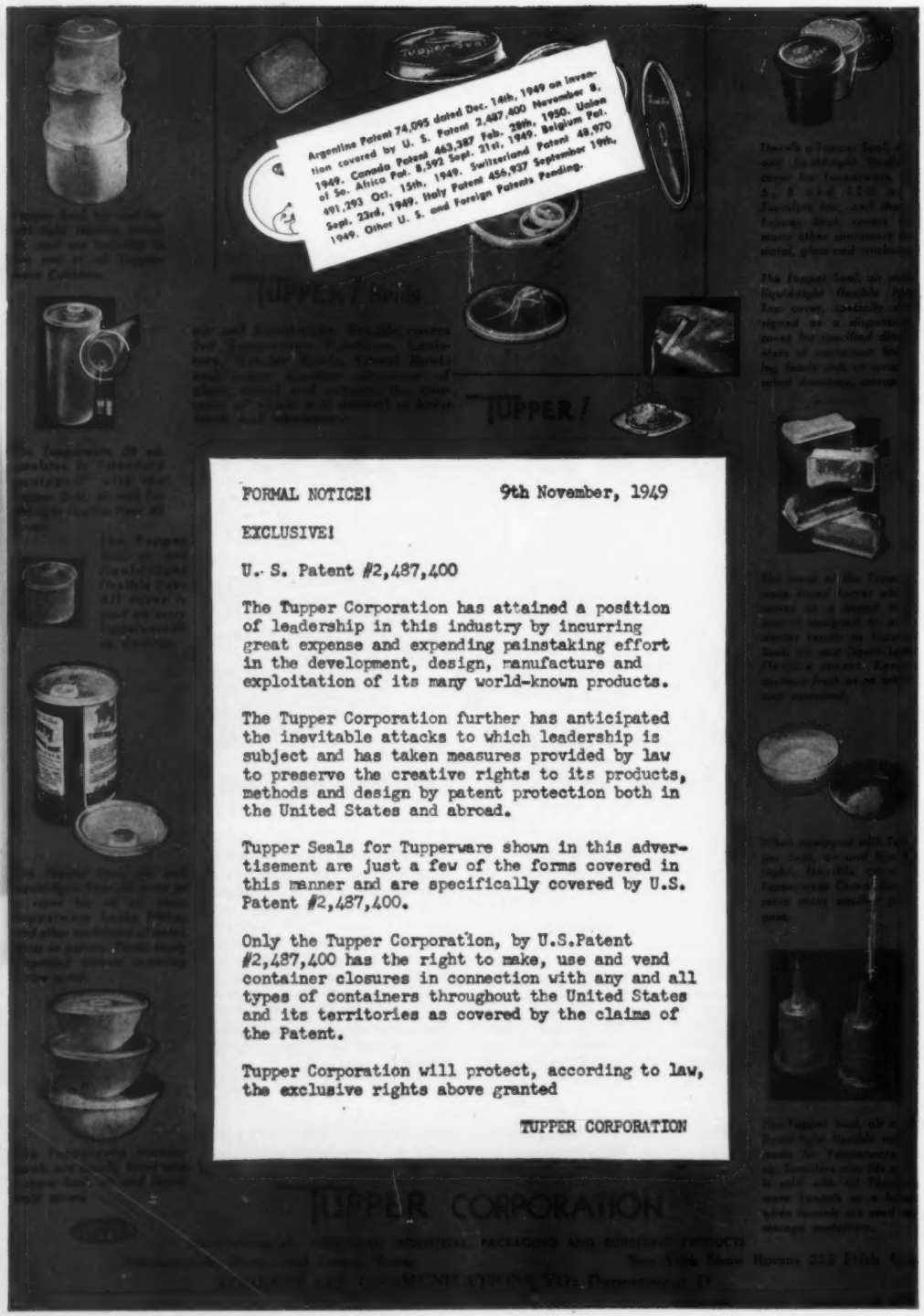
FOR 1 TO 300 OUNCE MOLDINGS—the W-S COMPLETELINE—the shortest distance between production and profit

P-S-55-A


Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Other U. S. and Foreign Patents Pending.
TUPPER
TUPPER CORPORATION

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

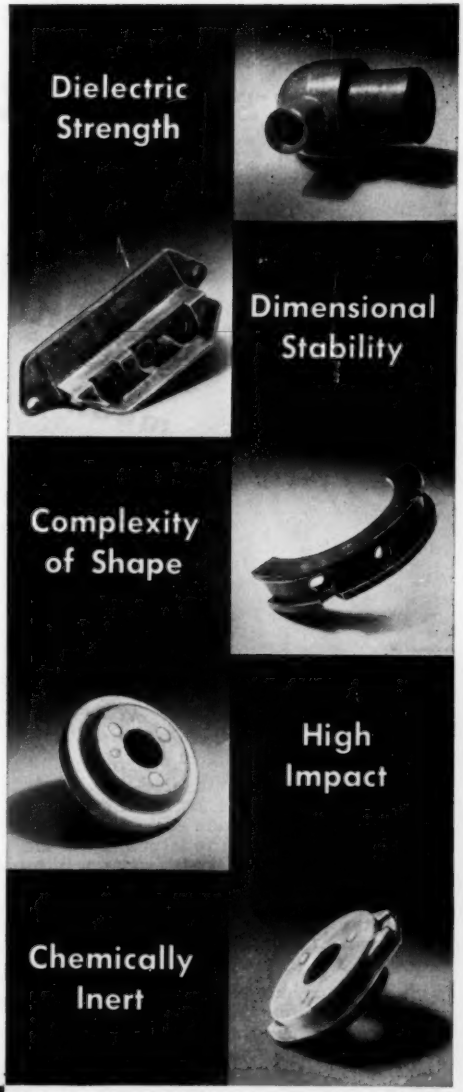
Could you use this *new* moulded plastic?

RIGHT NOW, plastics widens its entire scope of use! As these photos of unmachined production pieces show, Kurz-Kasch engineers have solved the problem of moulding glass-filled polyester resin in complex forms and shapes—with holes and with variable wall sections. Now you can plan on plastic mouldings with new strength characteristics.

CHARACTERISTICS. As a thermosetting resin, polyester offers excellent dimensional stability—good electrical characteristics—good resistance to chemicals and medium high temperatures (can withstand 325° F. continuously). The glass fibres, with high tensile strength, are a good electrical insulator, are chemically inert and heat resistant. Combined and moulded by the Kurz-Kasch process, you get a material with a specific* tensile strength comparable to steel! (*Specific-strength to weight ratio.)

PLEASE NOTE—Because of the strategic importance of this newest of a long line of Kurz-Kasch pioneering developments in plastics, we expect our output to be confined presently to priority orders. There are refinements still to be developed. And at this early stage, our technique still confines us to smaller to medium-sized pieces. But look at the possibilities! If your job is one for which this moulding technique and these material characteristics are applicable—let's talk it over, quick!

P. S. *Your conventional thermosetting moulding jobs would be in good hands here at Kurz-Kasch, too. We offer complete facilities, lots of production experience, and a reputation for knowing plastics.*



Kurz-Kasch

FOR OVER 35 YEARS PLANNERS AND MOULDERS IN PLASTICS

Kurz-Kasch, Incorporated • 1415 South Broadway • Dayton 1, Ohio

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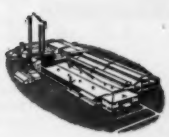


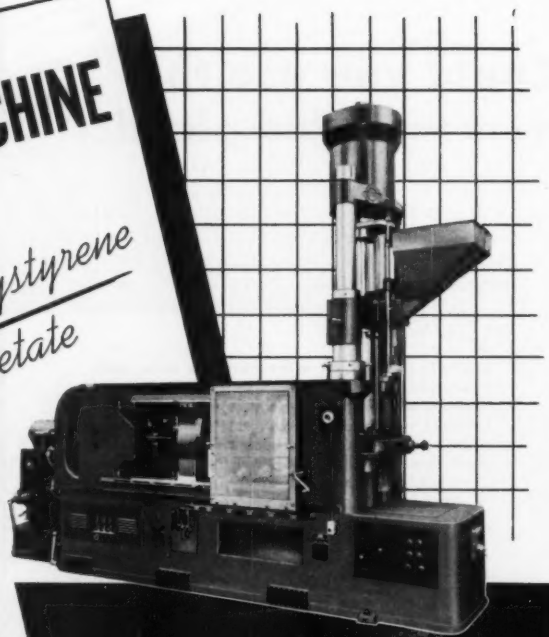
LET'S TALK LESTER TALK

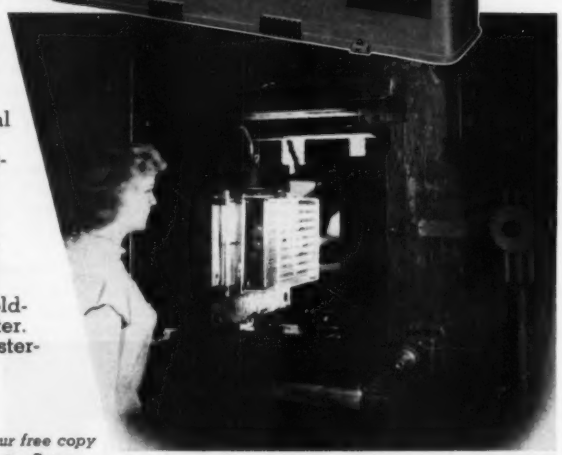
32 OZ. MACHINE

means

32 oz. polystyrene

40 oz. acetate





Yes, in Lester language, the 32 ounce machine means that it is rated in *32 ounces of polystyrene*. By the same token, we say greater die space and mean *28½" between the beams*. The large central die adjusting screw, 3750 extra watts of internal heat in the spreader, the solid frame with beams equivalent to 9" bars, hydraulic ejection—these exclusive Lester features, and more, mean faster, better production of large pieces.

The 30 ounce shot shown here is a Crosley Crisper Pan, being run by the General American Transportation Company in East Chicago, Illinois. It is typical of the fine molding that is being done on the 32 ounce Lester. For complete specifications check with Lester-Phoenix or the representative in your area.

Write for your free copy of the Lester Press

LESTER INJECTION MOLDING MACHINES

distributed by LESTER-PHOENIX, INC., 2621 CHURCH AVENUE • CLEVELAND 13, OHIO

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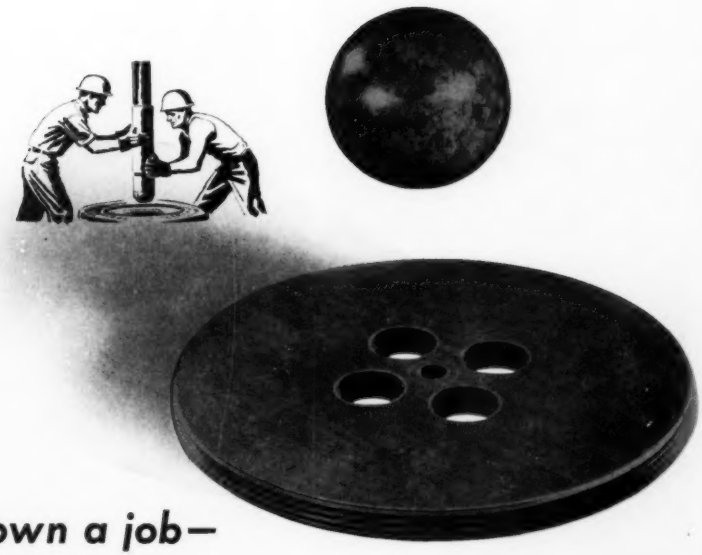


How to hold down a job— in a mile deep hole

When the well drillers have "made the hole" and an oil well is about to come in, a new job arises. And it's a real trick to handle, especially since there's a joker in it.

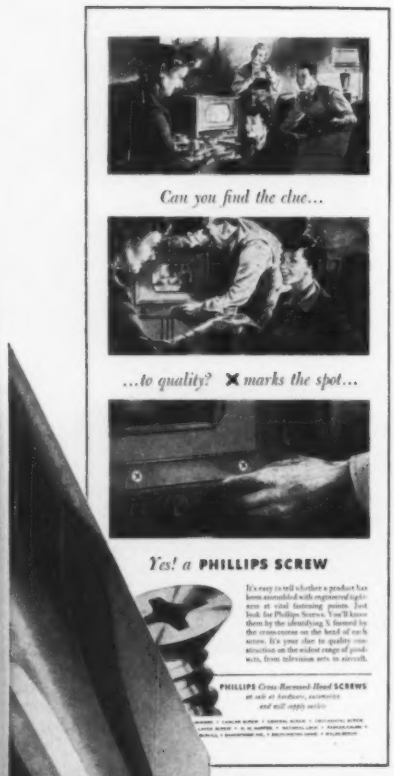
The job is to pump wet concrete into the hole to seal the sides. The joker appears because the shoe through which the concrete is pumped . . . the shoe that prevents the wet mix from backing up in the hole to seal it off . . . cannot be withdrawn after the mix has set.

The valve ball and thrust plate of the shoe, illustrated above, must be made from a hard, dense, tough material. They must resist the abrasive action of wet cement under considerable pressure. The ball must be dimensionally stable. Both parts must be moisture resistant. What's more, after the job is complete it must be easy to drill-out the working parts of the shoe to form a passageway.

This is a rare set of requirements. The makers of the Turbo Jet Float Shoe found in Synthane the material to meet them.

The Turbo Jet Float Shoe takes advantage of several Synthane properties. Other mechanical properties plus good electrical and chemical characteristics form an unusual *combination* which makes Synthane valuable for a wide range of applications. Synthane may be of help to you. To find out, send for the complete Synthane catalog. Address Synthane Corporation, 8 River Road, Oaks, Pa.

PLASTICS WHERE PLASTICS BELONG **SYNTHANE**



Part of the series of advertisements on Phillips Screws appearing in The Saturday Evening Post.

Can this clue to quality be found

on your product?

PHILLIPS SCREWS, with their identifying X formed by the cross recess, are recognized on sight as a mark of quality in well built products. The general public knows that Phillips Cross-Recessed-Head Screws make products stronger, better looking. 14 million readers of *The Saturday Evening Post* are being told that when it comes to assurance of quality, *X marks the spot.*

These screws cut driving time up to 50%, set up tighter, resist vibration. They are distinctively designed to give maximum strength of head, maximum driver strength. They eliminate driver skids and split screw heads. Whether you use Phillips wood screws, machine screws or tapping screws, you build a better product and you save time, work, money.

PHILLIPS *Cross-Recessed-Head* SCREWS

X *marks the spot... the mark of extra quality*

AMERICAN SCREW CO. • THE BLAKE & JOHNSON CO. • CAMCAR SCREW & MFG. CORP.
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THE FASTENERS OF TODAY . . . AND OF THE FUTURE

IT'S JUST GOOD PLASTICS PRODUCTION SENSE:

A STRAIGHT LINE

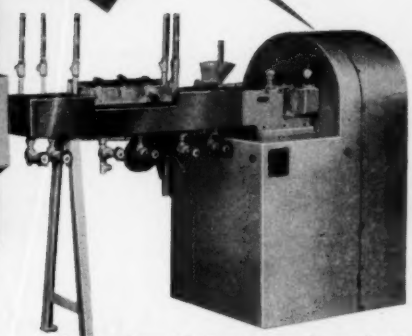
IS THE MOST EFFICIENT DISTANCE BETWEEN TWO POINTS

GET AHEAD...STAY AHEAD OF COMPETITION WITH WELDING ENGINEERS DUAL WORM COMPOUNDER-EXTRUDER*

Every Welding Engineers unit is custom-fitted to a particular job, operating in one continuous step from virgin feed to finished product with a maximum of efficiency. We welcome the opportunity to show you how a Welding Engineers Compounder-Extruder will "straight line" plastics production in your plant.

*Patents Pending and Issued

This elementary axiom, a straight line is the shortest distance between two points, parallels the functional story of Welding Engineers' Compounder-Extruder in a nutshell; with the current squeeze on men, materials and profits, it should be a top priority story with plastics production executives. For example, the production of quality molding pellets—"How can you make a *straight line* out of drying, batch-compounding,



milling and granulating or extrusion and pelletizing?" The solution is obvious! Eliminate those *separate* operations with their costly demands on multi-machine installations, extensive floor space and labor requirements. Avoid high power consumption and intermittent time lags. Get a Welding Engineers Dual Worm Compounder-Extruder package unit (as shown)—dry blended feed in the hopper to finished pellets in the drum...in ONE continuous operation.

MACHINERY DIVISION

WELDING ENGINEERS, INC.

NORRISTOWN, PA.

MANUFACTURERS OF COMPOUNDING-EXTRACTING-EXTRUDING EQUIPMENT FOR THE CHEMICAL, PETROLEUM AND PLASTICS INDUSTRIES

Tomorrow, A Garden!

Almost overnight man can transform a barren desert into life-giving, productive soil. So, too, Columbia's technicians and creative engineers will take a manufacturer's basic idea and fashion from it a finished, marketable plastic product of unlimited sales potential.

Columbia

CUSTOM MOLDERS OF PLASTIC PRODUCTS AND SPECIAL PLASTIC PACKAGING

COLUMBIA PROTEKTOSITE COMPANY, INC. • Carlstadt, New Jersey

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ONE OF AMERICA'S LEADING MANUFACTURERS OF SUN GLASSES, COMBS, BRUSHES, TOYS, HOUSEWARES

NEW...

16-Page Booklet on PLEXIGLAS Molding Powders

Send for your copy

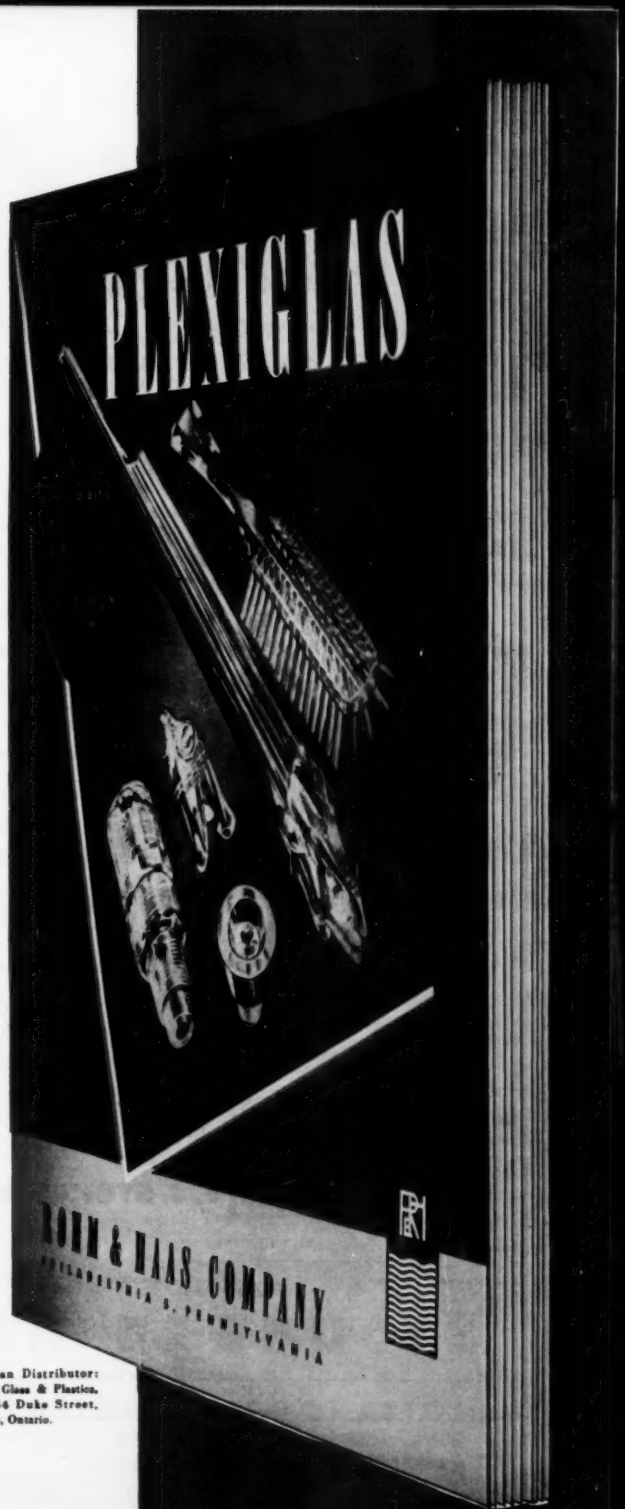
Specially prepared for plastics molders, this file-size booklet summarizes the up-to-date information you need on acrylic molding powders.

Its 16 concise, readable pages—fully illustrated with photographs and drawings—include a complete 2-page tabular digest of PLEXIGLAS physical properties, as well as helpful pointers on the application of specific PLEXIGLAS Molding Powders to various types of jobs.

For easier, more economical molding of industrial and automotive parts, signs and sign letters, household decorations and accessories—it will pay you to have on file this handy guide and reference booklet. A request on your business letterhead will bring you your free copy.

Write to Department MP

PLEXIGLAS is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.



CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

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Automatic molding reduces cost for R-B-M

Plastics parts for an electrical assembly are produced by the R-B-M Division, Essex Wire Corporation, Logansport, Indiana, by automatic molding. These are the parts that started R-B-M on the molding of plastics.

R-B-M chose automatic molding because of its distinctive advantages . . . uniformity of parts . . . low mold cost . . . low labor cost . . . material savings . . . controlled inventory . . . minimum investment.

Stokes Model 741 fully automatic molding presses were selected for the job because of their reliable, foolproof and flexible operation . . . and the speed with which they can be set up for production. Stokes fully automatic molding presses greatly simplify molding practices . . . one man can tend a battery of presses.

If you want to learn if your parts can be produced more economically by automatic molding . . . send parts or blueprints for a full analysis. There is no obligation, of course.

STOKES MAKES Automatic and Semi-Automatic Rotating Presses, Plunger Presses, Closure Presses, Transforming Presses, Industrial Tabletting and Powder Metal Presses, Vacuum and Special Processing Equipment, Water Stills and Special Machinery
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☐ *Send me complete literature on Stokes Automatic Molding Presses*

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For a SURFACTANT
(anionic, non-ionic or cationic)

an **ANTARON** or an **IGEPAL**

an **IGEPON** or an **ANTAROX**

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a **PREVENTOL, RAMASIT, NULLAPON, COLLORESINE** or other organic chemicals

Trade Names Reg. U.S Pat. Off.

...one source of supply now serves all your needs

More than 30 major industries need one or more of the types of products suggested in the brief listing above. Now all are available from one source. One of these may make your product *easier to sell* or *less expensive to manufacture*.

As of October 1, 1950, Antara Products—General Aniline & Film Corporation was merged with the Organic Chemicals Division of General Dyestuff Corporation.

The new *Antara Products Division of General Dyestuff Corporation,* thus formed, will coordinate and handle the sales and services of all chemicals, intermediates, and allied products made by the General Aniline & Film Corporation.

Extensive research staffs and facilities support the development and application of all Antara Products—available to work with you in the improvement of an existing product or the development of a new one. Your inquiry is invited—without obligation. It will bring a prompt opinion as to whether one of the Antara Products may be adaptable to your needs. Kindly address your inquiry to Department 42.

NOTE: The Dyestuff Division of General Dyestuff Corporation will continue to operate as before, without change in personnel or policy.

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DIVISION OF

GENERAL DYESTUFF CORPORATION

435 HUDSON STREET • NEW YORK 14, NEW YORK

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Boston • Providence • Philadelphia • Charlotte, N. C. • Chicago • Portland, Ore. • San Francisco • Oakland

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Production Efficiency.... Far Beyond Expectations!!

Congratulations, Daddy—better grab for those smelling salts. You certainly have caught more than your share of tax deductions.

We don't want to take any glory away from you, Mr. Father of the Year, but isn't this going a little too far? Production efficiency should be a calm, quiet, day by day effort—not intermittent.

For close to 30 years, for big and little industries, we here at Boonton have given birth to many successful ideas . . . delivering them in the form of soundly planned and intelligently engineered molded plastics products . . . day after week.

We are not, nor do we claim to be, miracle workers—but long experience and a top grade organization combined with ample, modern facilities can pay *you* dividends as well as ourselves.

Let us prove to you how these facilities can blend with your needs to breed satisfaction—like the bundle of six below.

BOONTON MOLDING CO.
BOONTON, NEW JERSEY
N. Y. Office—Chanin Bldg., 122 East 42nd Street,
Murray Hill 6-8540

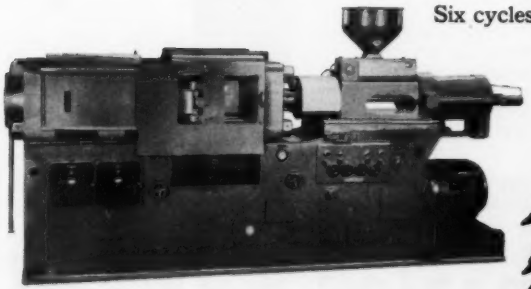
full benefit of the ~~old~~ new ONE-TWO!

Sharp, fast set-up...then the close-in power punch...

that's the essence of Fellows speed-cycle improvement.

The Fellows two-speed injection plunger...rapid advance,

then peak power...is ideal with pin-point gating.



Six cycles per min. (dry-run) on the 5C-8!

Better look at Fellows first.

Fellows
LEOMINSTER

injection molding equipment

THE FELLOWS GEAR SHAPER CO., Plastics Machine Div., Head Office & Export Dept., Springfield, Vt. Branch Offices: 616 Fisher Bldg., Detroit 2. 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1 • New England Distributor: Leominster Tool Co., Leominster, Mass.

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Famous Santay safety features . . . highly polished low-loss polystyrene body with long leakage path extended by use of five "petticoats," or radial fins. Carefully designed and completely insulated for extra safety and greater versatility. No metal touches hand. Grounded Arc-Over Protection Baffle . . . metal ground shield extends within handle. Light weight, moisture and perspiration resistant with low heat conductivity. Withstands 30,000 to 50,000 volts in testing equipment.

Consult us for your plastic needs. Experienced Santay engineers will analyze your requirements just as they have done for RCA and many others. Phone or write. Our nearest representative will call on you.

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INJECTION MOLDING · METAL STAMPING · ELECTRO-MECHANICAL ASSEMBLIES

Bowling pins of PLIO-TUF molded over a wooden core duplicate weight and "fly" of regular wood pins — but last through 1,000 "lines" on alleys — more than triple service compared with standard pins without splintering, denting or chipping.

For toughness and impact resistance it's Plio-Tuf

WHEREVER you need hardness, high impact resistance, low water absorption and flexible physical properties, turn to PLIO-TUF—Goodyear's blend of a natural or synthetic rubber and a high styrene copolymer. It's ideal for such applications as the molded cover on the bowling pins shown here—helmets, body protective equipment, golf club heads, bowling balls and golf ball covers. Industrial equipment uses include textile spool ends, water- and impact-resistant carrying cases, chemical buckets, tote boxes and the like.

PLIO-TUF is readily machined—easily post-formed—can be buffed to a high gloss. Compounds in the PLIO-TUF "family" are normally made up with from 60-90 parts of copolymer, and GR-S, nitrile, natural or Neoprene making up the balance of the 100-part batch. Properties of PLIO-TUF can be readily varied, depending on the combination and specific proportion of rubber and resin used.

Write today for full details, technical assistance, and samples for your own evaluation, to:

Goodyear, Chemical Division, Akron 16, Ohio

Proved in PLIO-TUF—Try Goodyear's PLIOLITE S-6

Outstanding results in the compounding of PLIO-TUF have been recorded with Goodyear's PLIOLITE S-6—a high styrene content resin. As a rubber reinforcing agent, other uses include shoe sole compounds, flooring, electrical wire and cable insulation, rubber hose and tubing, and a wide variety of molded and inflated rubber items. Ask us for details.

GOODYEAR

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

Plio-Tuf, Pliolite—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Hand your headaches to "CUBEE"

curing Plastics Problems is his business!

Take advantage of experience the next time you have a problem involving Plastics. Five of the key people here have a total of more than 75 years experience in this business.

We offer all of the services you need—designing, die-making and molding—all under one roof. It pays to utilize our "know-how". After all, Plastics is our business. Call "Cubee" the next time you are planning in Plastics.

Q-B Says:

"The next time you are stymied
And a problem's got you down,
Hand your headache to Cubee
He can wipe away that frown."

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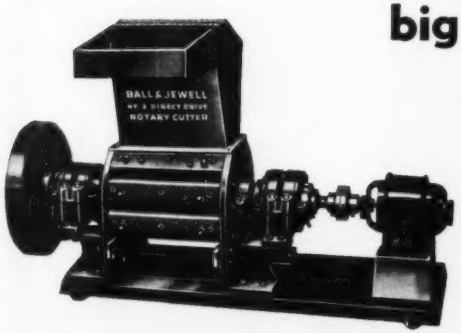
B&J BUILDS THE ANSWER TO ANY GRINDING PROBLEM —

big cutters for big jobs . . . midget cutters for small jobs!



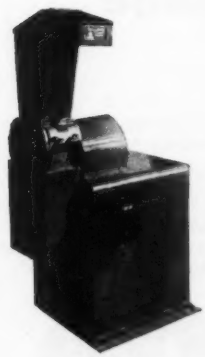
B & J has a complete line of cutters to meet every individual requirement, with all units reengineered in the last 12 months, including the addition of wider throat openings.

NO. 2 HIGH CAPACITY PLASTIC GRANULATOR

shows a direct drive application. Cutter has 8″ x 28″ throat opening and capacity up to 2,000 lbs. per hr. . . . is ideal for grinding *milled vinyl* and all type of plastic scrap . . . will cut practically any size or weight piece that can be fed into hopper.

NO. ½ T.D. FOR GRINDING ROOM

Handles sizeable volume of scrap, as much as 500 lbs. of styrene per hour, yet requires minimum floor space. Available with 5″ x 20″ or wide 8″ x 20″ throat to eliminate clogged hoppers.



HANDY MIDGET FOR PLACING BESIDE MOLDING MACHINES

Provides 50-75 lbs. per hour capacity, handling gates, sprues, etc. from ¼″ to ½″ sectional thickness, dependent on type material, fed into 5½″ x 6″ throat.

For grinders with capacity of 50 to 3,000 lbs. per hr. contact:

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26 Franklin Street, Brooklyn 22, N. Y.
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☐ NO. 2 B&J GRINDER
☐ NO. ½ T.D. ☐ MIDGET

NAME .....

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CITY ..... STATE .....

YOUR NEAREST B & J REPRESENTATIVE

SAN FRANCISCO, CALIFORNIA: B-H-S Machinery Sales Company; LOS ANGELES, CALIFORNIA: Machinery Sales Corporation; PITTSBURGH, PENNSYLVANIA: Stanley Berg & Company; OMAHA, NEBRASKA: Fuchs Machinery & Supply Co.; CINCINNATI, OHIO: Index Machinery Corporation; SPOKANE, WASHINGTON: W. R. Matthews Machinery & Tool Supply Company; CHICAGO, ILLINOIS: Neff Kohlbusch & Bissell; MILWAUKEE, WISCONSIN: Neff Kohlbusch & Bissell; HOUSTON, TEXAS: Preston Machine Tool Sales Co.; MINNEAPOLIS, MINNESOTA: Charles W. Stone Company; LEOMINSTER, MASSACHUSETTS: Standard Tool Company; DETROIT, MICHIGAN: Thoresen-McCosh, Inc.; CANADA: TORONTO & MONTREAL: Williams & Wilson Ltd.; FOREIGN DISTRIBUTORS: Omni Products Corp., New York 16.

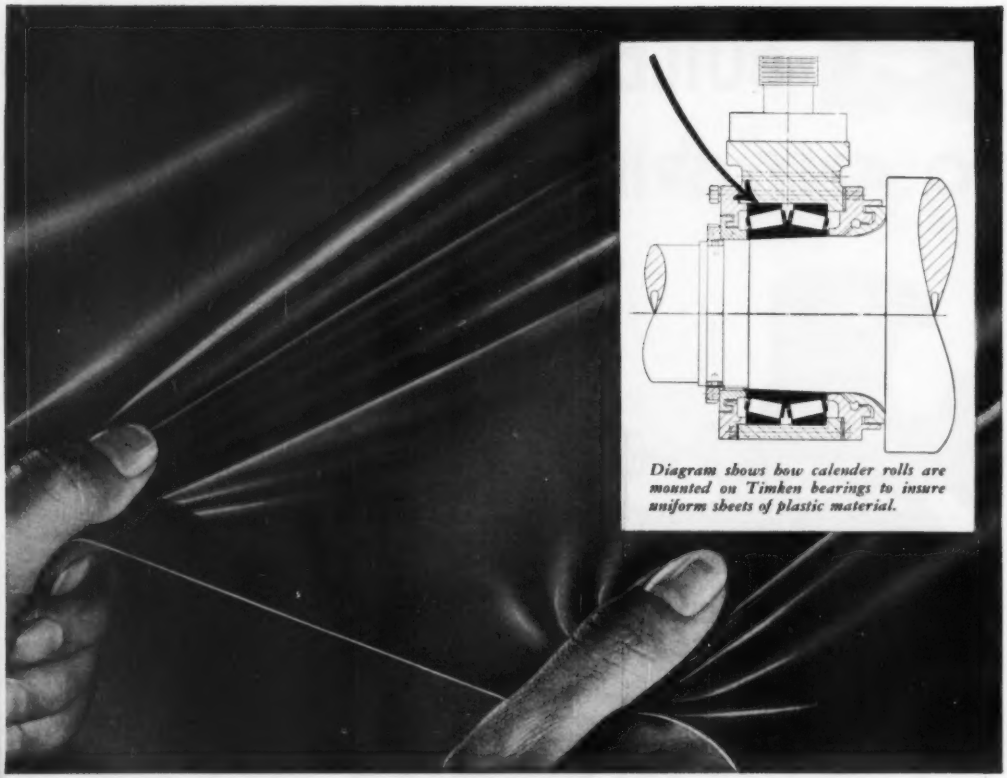


Diagram shows how calender rolls are mounted on Timken bearings to insure uniform sheets of plastic material.

New way to keep film gage under your thumb

PRECISION control of plastic film gage is now possible with calender rolls mounted on Timken® tapered roller bearings. Losses due to rejects and too-thick film are cut to a minimum. And accurate gage control means uniform film thickness with no variation in color shades.

Timken roller bearings can be accurately adjusted at installation to allow for heat expansion of the rolls. Vertical roll movement is minimized, calender precision is maintained because rolls are held in positive alignment. Due to their tapered construction, Timken bearings take any combination of radial and thrust loads.

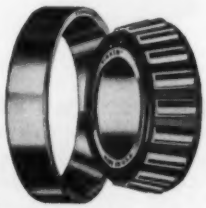
With Timken bearings on your plastics mill equipment, maintenance costs are reduced. Tighter, lubricant-retaining closures are permitted. Roll neck wear is eliminated.

You can be sure of uniform high quality plastics, minimum maintenance costs, fewer rejects, with Timken bearings on your calenders, mills, refiners and mixers. Timken bearings are backed by 50 years of bearing research and development, and are first choice throughout industry. They offer special advantages to you. Write The Timken Roller Bearing Company, Canton 6, Ohio, for full details. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION ✳

PLASTICS SCRAP

bought sold reworked

We offer
the World's finest facilities for:
RECLAIMING • REPROCESSING
RECOMPOUNDING • RECOLORING

We reprocess *Your* Plastics Scrap, By-Products, Surplus for *Your* own Re-Use.
We have complete laboratory facilities for Testing, Analyzing, and Pilot Running of Customer's Materials.

GRANULATING • PELLETIZING
CHEMICAL FLOTATION • WASHING • CLEANING • DRYING
SEPARATION OF CONTAMINATED MATERIALS
REMOVAL OF FOREIGN MATTER
COMPOUNDING • MIXING • COLORING • EXTRUSION

UNLIMITED KILN DRYING FACILITIES

OUR SERVICE

As the world's leading Plastics Scrap Reclaimers we offer the almost unlimited facilities of our vast plant to industry in these days of shortages in all basic raw-materials.

We have available over 150,000 sq. ft. of floor space devoted exclusively to the processing of plastics — virgin and scrap — resinous materials or by-products.

We specialize in the reduction to small particles — to your most exacting specifications — of all lumps, blocks, mill ends, bleeder waste — regardless of size and whether rigid or soft.

We also custom-compound *all* thermoplastics to your specifications.

A. BAMBERGER

CORPORATION
PLASTICS MATERIALS
703 Bedford Avenue, Brooklyn 6, N. Y.
Phone: MAin 5-7150
CABLE: CHEMPROD BROOKLYN

A PLANT MAINTENANCE MAN SAYS:

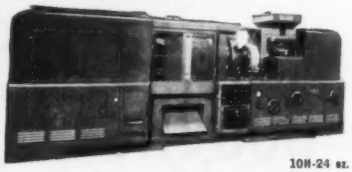
MARVEL SYNCLINAL FILTERS ON OUR MACHINES GIVE US TWO TO THREE TIMES MORE OPERATING TIME BETWEEN CLEANINGS

MR. A. NEUMANN,
Assistant Superintendent of Maintenance, Superior Plastics division of Commonwealth Plastics, Inc.

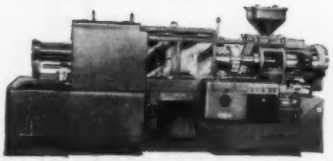
HERE IS WHAT HAPPENED AT SUPERIOR PLASTICS

Superior Plastics, Division of Commonwealth Plastics, Inc., a large manufacturer using many injection molding presses in 8 oz., 16 oz., 22 oz., and 24 oz. sizes has installed Marvel Synclinal sump type filters in their machines. All of these machines are hydraulic. Mr. Neumann, assistant superintendent of maintenance, summarizes the amazing results thus:

"Since installing Marvel filters we are able to operate our machines for four to six months before cleaning filtering units as against only two months with the former filtering equipment. This gives us two to three times as much production between cleanings. Furthermore, cleaning the Marvel is so simple and easy that we disassemble, clean, and reassemble it in minutes, a difficult procedure with the previously used filters. The inter-changeability of Marvel parts permits other important conveniences and economies."

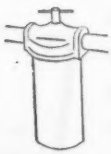


10H-24 oz.



10D-8 oz.

Illustrated are two of the many Reed-Prentice injection molding machines used at Superior Plastics, division of Commonwealth Plastics, Inc. Photos courtesy Reed-Prentice, Inc.



FACTS NOT CLAIMS

Engineers decide on the basis of the record, on the basis of measurable facts rather than on claims of the "campaign promise" variety. Here is a fact with meaning:

IN 1949 & 1950 ALONE
152 MANUFACTURERS

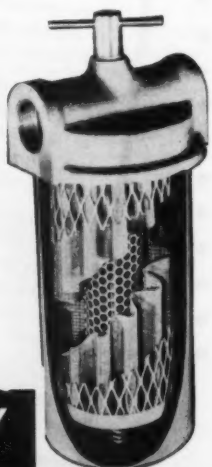
Picked
MARVEL SYNCLINAL FILTERS
as their O.E.M. Choice

Marvel filters are available in sump and line type models, in capacities from 5 to 50 g.p.m. (multiple installations effect greater capacities), and in wire mesh sizes of 30 to 200. Line models operate in any position and may be removed without disturbing pipe fittings. For efficient filtration of liquids in all HYDRAULIC and LOW PRESSURE systems investigate Marvel Synclinal Filters.

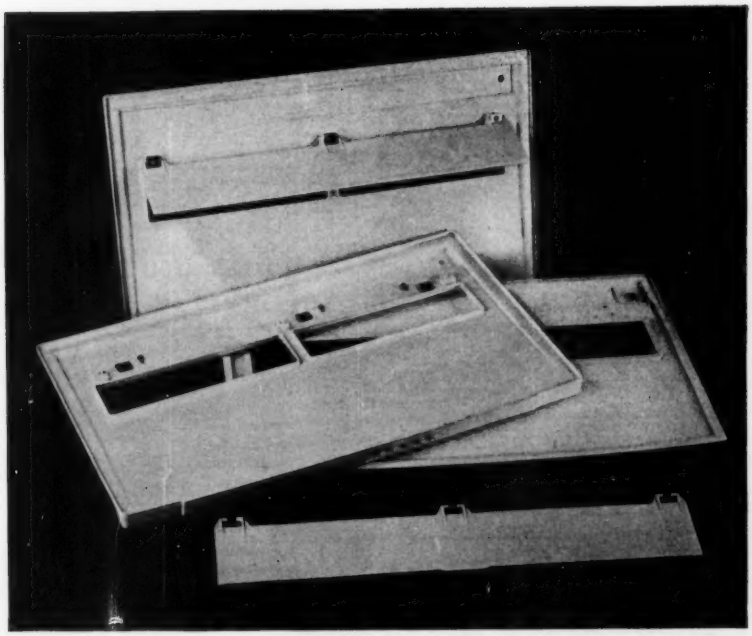
Write for catalogs 104 and 202

SUMP TYPE (cutaway)

MARVEL ENGINEERING COMPANY
625 W. Jackson Blvd. Chicago 6, Ill.



LINE TYPE (cutaway)



Nash Kelvinator obtains a single strong unit by cementing the two halves of this refrigerator baffle assembly after inserting the insulation material.

Another production problem solved

by cementing Lustrex styrene plastic

For articles that cannot be molded in one complete unit, either because of their design or the necessity for combining two different types of material, ingenious cementing techniques solve many production problems. Nash Kelvinator, for example, cements the top and bottom sections of this refrigerator baffle assembly with insulation between the two halves.

Styrene plastic parts properly cemented can be bonded together with a strength approaching that of a single-unit molding; other materials can also be cemented to styrene with satisfactory bond strength.

Monsanto has collected a lot of useful information on cementing methods in a new booklet, "Cementing Technique for Lustrex Styrene Moldings." It describes various cementing methods – styrene to styrene, styrene to non-porous surfaces, styrene to porous surfaces. Recommended cements are indicated together with sources and methods of application.

Write TODAY for your free copy and for full information about the big Monsanto family of plastics. Lustrex: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY
. . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division, Room 2603
Springfield 2, Mass.

☐ Please send me the booklet, "Cementing Technique for Monsanto Lustrex Styrene."

☐ Please send me information about Monsanto's family of plastics.

Name & Title

Company

Address

City, Zone, State

Source of bright, colorful VINYL UPHOLSTERY

Increased consumer acceptance of supported and unsupported vinyl upholstery attests the desirability of attractive whites and soft pastels.

In vinyl upholstery TITANOX rutile or anatase titanium dioxides impart exceptional whiteness, brightness and opacity, and their compatibility with all types of synthetic or natural polymers helps maintain natural strength.

TITANOX-A, anatase type, is suggested where whiteness is of paramount interest. TITANOX-RA—the rutile type—is recommended for outstanding whiteness at low loadings. In heavily loaded stocks and in many tints, where the tinting strength of the pure oxides is not required, the rutile-calcium pigment—TITANOX-RCHT—may be used. All TITANOX pigments maintain bright, clean tints and their fine and uniform particle size affords easy mixing and grinding for complete dispersion throughout the polymer.

Our Technical Service Department is always available to help you with your problems in pigmenting all types of natural or synthetic polymers. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments, Ltd., Montreal 2; Toronto 1.

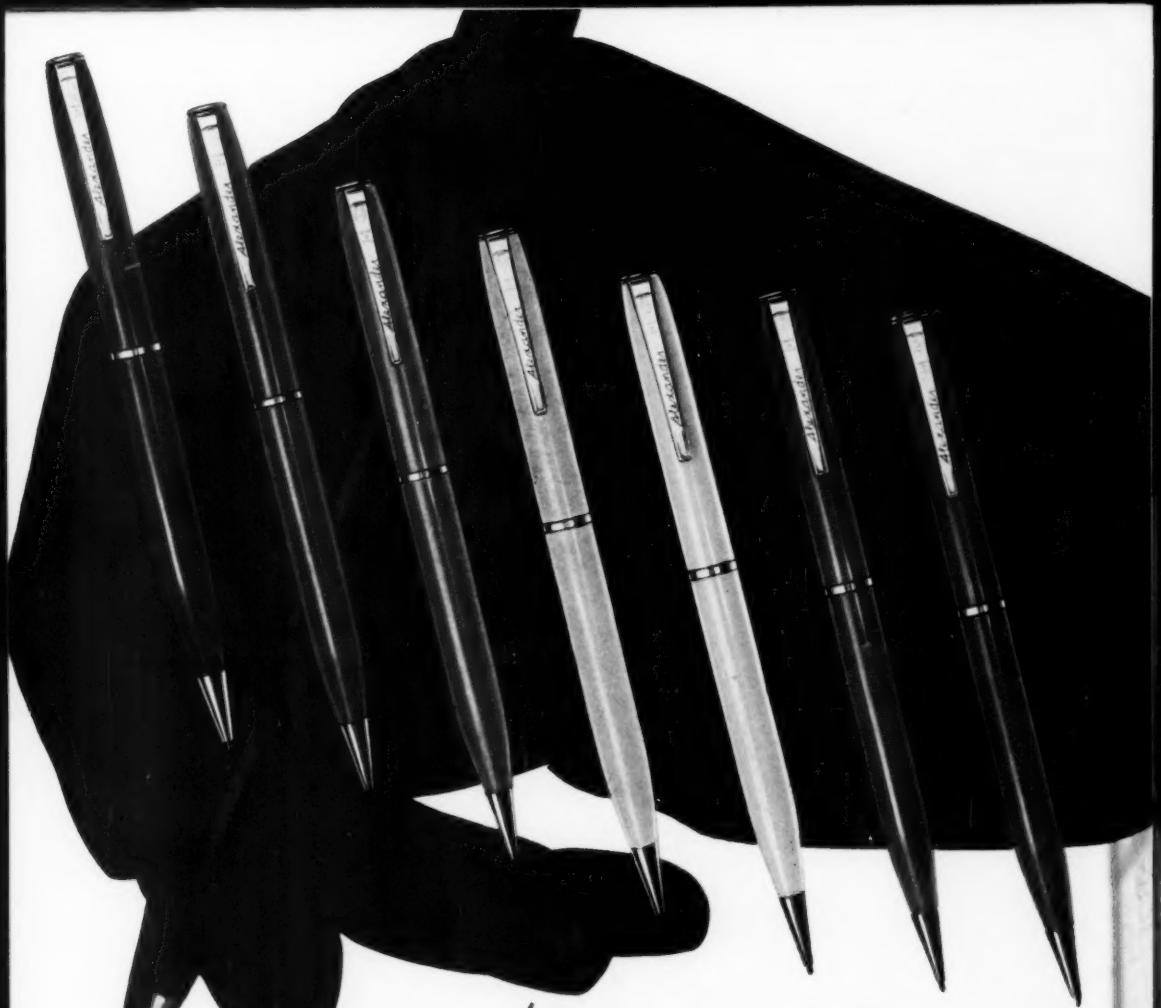
REG.

TITANOX

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY



Molded right for writing

Our molding assignment for these Alexander pencils was to produce writing instruments properly balanced—smooth of line. Color specifications were carefully met—functional needs of the product were painstakingly watched.

This careful consideration of functional needs characterizes our production activity. First we determine whether or not plastics can do the best job for you. Then we make sure *in advance*, that the plastic material used will be *right* for your product. Our engineers and molders now go to work and create a plastic product that is *right* every way you look at it. *Right* for appearance—*right* for stability—*right* for sales appeal.

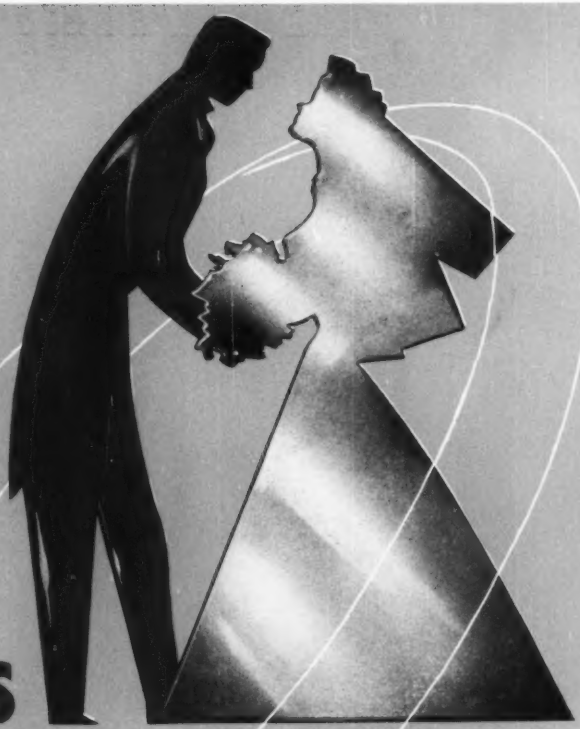
We'd like to convince you in person that ours is the *right* molding service for you. Tell us about your plastic problems. You'll receive a speedy and, we believe, a helpful and profitable answer.

Write on your letterhead for the new injection Molded and Extruded Plastics catalogue. Or, for detailed information about Corro-Seal® pipe, tubing and fittings, write for circulars containing data and illustrations.

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Plexiglas, Nylon, Polystyrene, Styron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, Corro-Seal®, Saran, and other Thermoplastic Materials

2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS



PLASTICS ...plus Related Materials

Made for Each Other

under MPc Supervision

Good product design frequently teams molded plastic parts with other related materials. Stamped metal fittings may be required...or inserts of glass, rubber or fibre. Producing such combination assemblies is routine procedure at **MPc**.

Under **MPc** guidance, the component parts are designed and engineered to complement each other perfectly. Production in scheduled quantities, proper assembly and on-time delivery...all this becomes **MPc's** undivided responsibility.

Isn't this the kind of service you require to ease the strain of augmented production schedules? Submit your plastics molding problem to MOLDED PRODUCTS CORPORATION, 4535 W. Harrison St., Chicago 24, Illinois.

FREE "Data Book of MPc Facilities"
An engineering-eye view of MPc press capacities and other production facilities...together with a survey of MPc special skills available for your use. Write for your copy.

PLASTICS DIVISION
MOLDED MPc PRODUCTS
CORPORATION

"no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Crucible Steel Company of America
Dept. MO, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name_____ **Title**_____

Company_____

Street_____

City_____ **State**_____

CRUCIBLE first name in special purpose steels

TOOL STEELS

fifty-one years of Fine *steelmaking*

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

Improve your vinyl plastics operations and cut costs

...with "Dutch Boy" DS-207

PATENT APPLIED FOR

...here's a co-stabilizer with a triple advantage

"Dutch Boy" Stabilizers	
PRODUCT	**USE**
TRI-BASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRI-BASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Sheeting, extrusion and molded compounds, i.e., insulated wire and vinyl phonograph records
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent film and sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	High grade insulated wire and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light
DYPHOS (Di-basic Lead Phosphite)	Excellent for heat and light in all opaque stocks, including Plastisols and Organosols
NORMASAL (Normal Lead Salicylate)	Vinyl flooring and other compounds requiring good light-stability

You use only half of one per cent, or so—*But See What You Get* with "Dutch Boy" DS-207—a co-stabilizer that speeds production, upgrades quality, and cuts costs.

DS-207 provides solid phase lubricity at all temperatures, and is highly dispersible. Thus, processing is smoother and faster, both in calendering and in molding.

DS-207, stable at temperatures nearing 600°F, imparts excellent heat- and light-stability as a co-stabilizer. Tack control is good. It also increases water- and solvent-resistance in finished products.

Let our technical staff show specifically what DS-207—and the other "Dutch Boy" chemicals—can do for you. Call on us.

Dutch Boy* **CHEMICALS**

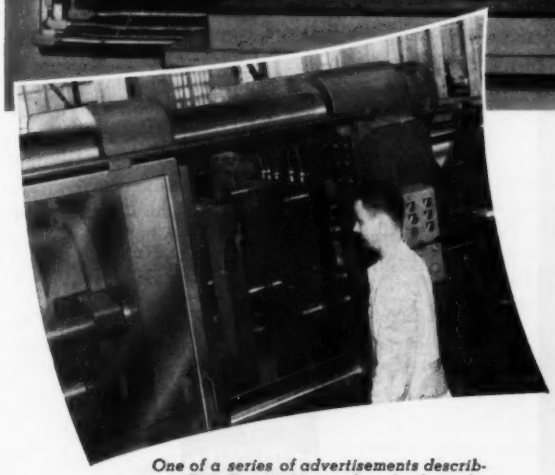
*Trademarks Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY, *111 Broadway, New York 6, N. Y.*

ERIE RESISTOR'S

great modern facilities and proven know-how mean better molded plastic parts for you

BIG JOBS from BIG PRESSES



One of a series of advertisements describing Erie Resistor's complete facilities for quality custom molded plastics.

Two huge injection molding presses, each capable of molding 80 ounces of polystyrene, supplemented by a new 48 ounce press, enable Erie Resistor to mold the largest pieces ever shaped by the injection molding process. And, through the use of multiple dies, they speed production of smaller parts.

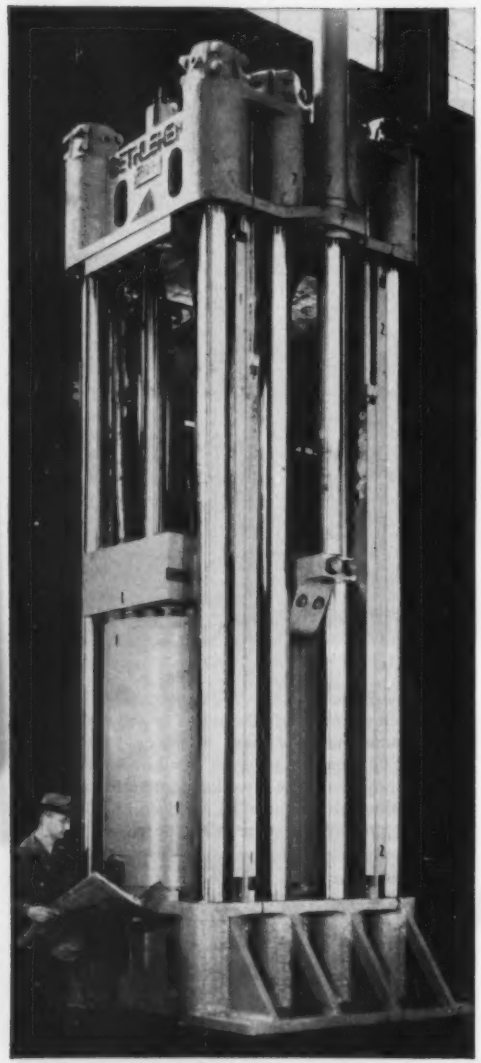
Erie Resistor, pioneer in custom injection molding, has long enjoyed a reputation for taking up where others leave off, for an ingenuity in finding ways of doing what others said couldn't be done. With expanded facilities Erie's know-how will have even greater opportunity to serve you.

Plastics Division

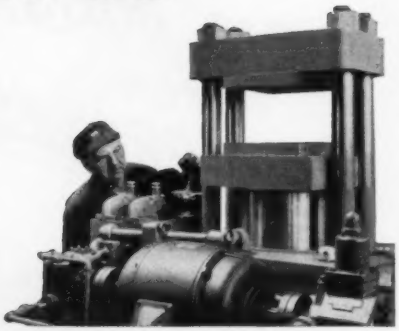
ERIE RESISTOR CORP., ERIE, PA.

LONDON, ENGLAND . . . TORONTO, CANADA

To the buyer who wants his presses "JUST SO"



A medium-sized (2670-ton) Bethlehem molding press.



In building hydraulic presses we expect, naturally, that our customers will insist upon accuracy in every small detail.

We like that, for we're very particular too. About those fine points of engineering that make or break a design. About the craftsmanship that's the difference between a good part and a bad one. About the forgings, castings, and other components that make up the finished product. Even about small metallurgical points that the average buyer might not think of.

In short, you'll find Bethlehem a mighty dependable builder — and designer, too, if you care to put the whole job in our hands.

See us for hot-plate, molding, or metal-forming presses with self-contained or separate power equipment — or without the power system, if you choose to furnish your own. We'll do a good job for you . . . from blueprints to finished product.

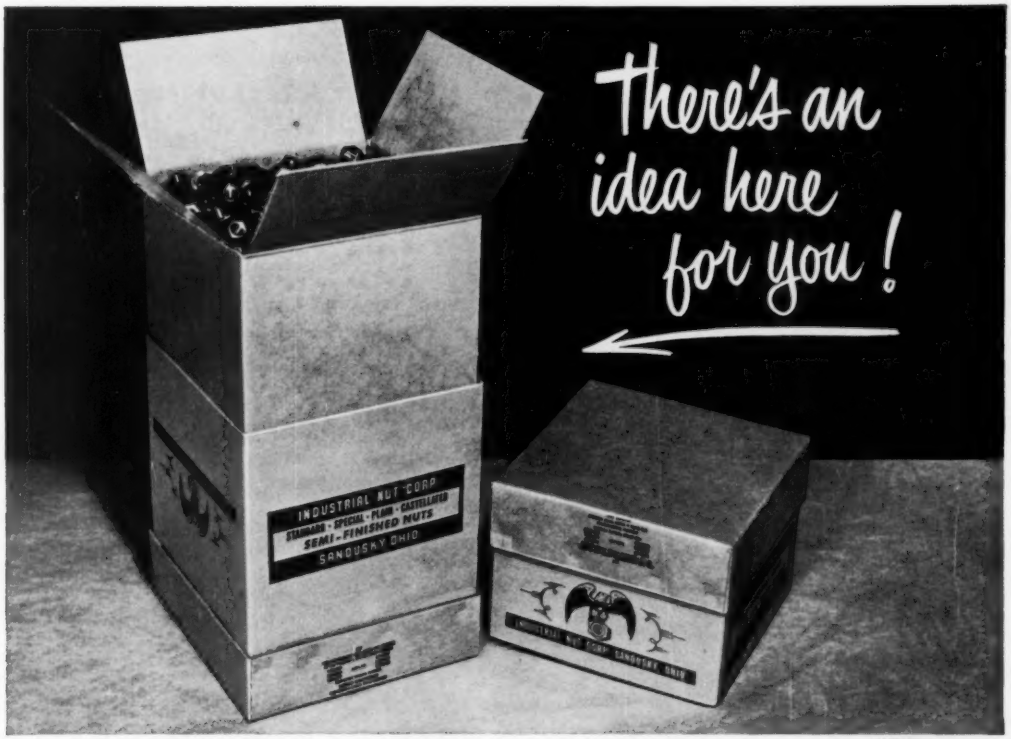
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

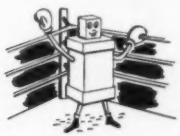
★ BETHLEHEM STEEL ★

BETHLEHEM *Custom-Built* HYDRAULIC PRESSES

FOR PLASTICS . . . METAL-FORMING . . . FIBER BOARD . . . WALLBOARD . . . LINOLEUM . . . VULCANIZING



PATENTED



This sturdy lightweight shipping box handles a heavyweight's job!

Nuts and bolts, castings, hardware, metal extrusions, nails, textile yarns and finished goods, and similar heavy and bulky products really give a shipping box a beating. Until this H & D lightweight came along, only "heavyweight" boxes could take such punishment. But with stitched caps on half outer liners that completely eliminate distortion in stacking, this low-cost box takes all the beating a heavy load can hand out. No wonder it cuts packing and freight costs!

For scores of ways to cut shipping costs . . . to lower packing costs . . . and to increase sales through better display, write for H & D's book, "How to Pack It." Hinde & Dauch, 5102 Decatur St., Sandusky, Ohio.

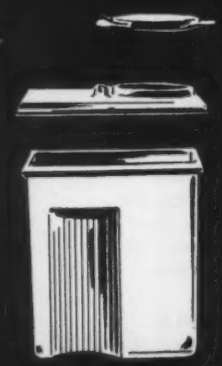
H&D®

HINDE & DAUCH

Authority on Packaging

FACTORIES IN: Baltimore • Buffalo • Chicago • Cleveland Detroit • Gloucester, N. J. • Hoboken, N. J. • Kansas City, Kan. Lenoir, N. C. • Richmond, Va. • Sandusky, Ohio St. Louis • Watertown, Mass. *Offices in principal cities.*

A NEW TRIUMPH OF PLASTIC MOULDING!



3 pieces fit together perfectly for air-tight bond . . . yet remove easily for cleaning.

All the skill of
BRIDGEPORT
MOULDED PRODUCTS

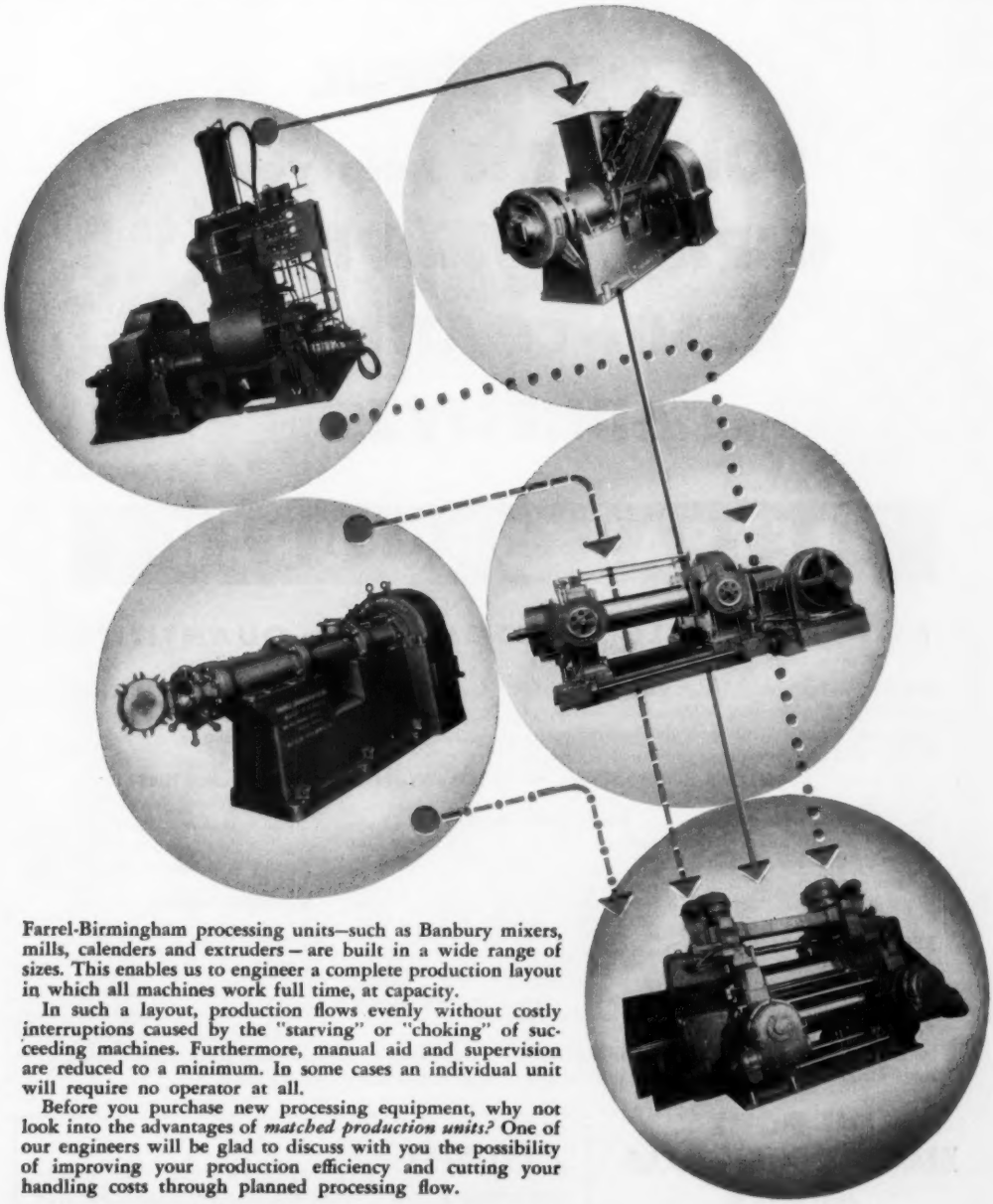
is poured into this NEW SPARKLEWARE air-tight container. Only plastic engineering ability of the highest degree could produce this air-tight, easily cleanable container. Designed by the famous firm of Lippincott and Margulies, Inc., New York City, this amazing container is the only one of its kind on the market. The bottom of sparkling polystyrene in uniform, rich color fits perfectly into grooved polyethylene top section. So ideal is the union that the container is actually air-tight! The spout and top section also remove easily, make cleaning a breeze. If you require such highly precise, close tolerance plastic moulding, write to the Bridgeport Moulded Products Company.

BPM **Bridgeport Moulded Products, Inc.**

Box 3276 Barnum Station, Bridgeport 5, Conn.

These Units Can All Be

MATCHED IN CAPACITY FOR FREE-FLOWING PRODUCTION



Farrel-Birmingham processing units—such as Banbury mixers, mills, calenders and extruders—are built in a wide range of sizes. This enables us to engineer a complete production layout in which all machines work full time, at capacity.

In such a layout, production flows evenly without costly interruptions caused by the "starving" or "choking" of succeeding machines. Furthermore, manual aid and supervision are reduced to a minimum. In some cases an individual unit will require no operator at all.

Before you purchase new processing equipment, why not look into the advantages of *matched production units?* One of our engineers will be glad to discuss with you the possibility of improving your production efficiency and cutting your handling costs through planned processing flow.

FARREL-BIRMINGHAM COMPANY, INC. • ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB 567

NEW From Du Pont...

A POWERFUL SOLVENT to help you IMPROVE your VINYL RESIN COATINGS and ADHESIVES

TETRAHYDROFURAN

NOW AVAILABLE IN COMMERCIAL QUANTITIES

It's the ideal solvent for high molecular weight polyvinyl chloride, vinylidene chloride copolymers, and other difficultly soluble organic materials. With Tetrahydrofuran you can get solutions of comparatively high solids content at practical working viscosities. Tetrahydrofuran is an excellent solvent for many resins used in the production of clear, light-colored coating compositions.

EFFECTIVE ADHESIVE COMPOSITIONS can be formulated with Tetrahydrofuran. Typical compositions include a 10 per cent solution of polyvinylidene chloride in Tetrahydrofuran to seal polyvinylidene chloride sheets and bags. A 10 per cent solution of polyvinyl chloride in Tetrahydrofuran is an effective adhesive for polyvinyl chloride sheets.

PHYSICAL PROPERTIES

Appearance	Colorless, mobile liquid
Odor	Ether-like
Molecular Weight	72.10
Boiling Range @ 760 mm.	65-67°C.
Specific Gravity, 20/4	0.887
Index of Refraction, N20/D	1.407
Flash Point	−17°C.
Vapor Pressure @ 25°C.	176 mm.
45°C.	385 mm.
65°C.	760 mm.
Solubility	Miscible with water and most common organic solvents.

TETRAHYDROFURAN WATER-MIXTURES have unusual solvent power. The mixture is a better solvent for cellulose acetate than Tetrahydrofuran alone.

SOLVENT POWER of less active solvents can be improved by addition of Tetrahydrofuran. For example, clear films can be cast from 10 to 15 per cent solutions of high molecular weight polyvinyl chloride in a 65/35 mixture of Tetrahydrofuran with methyl ethyl ketone.

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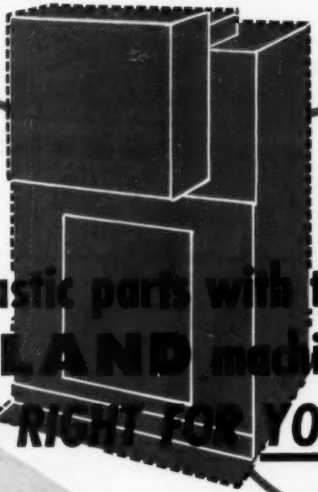
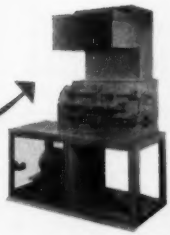
ROTARY CHOPPER





PREBREAKER

Cut up large plastic parts with the CUMBERLAND machine that's RIGHT FOR YOU!

PELLETIZER

CUMBERLAND GRANULATING MACHINES

MODELS 0, ½, 1½

Small and medium capacity. Direct coupled for central grinding. V-belt driven for use beside each injection machine. Request Bulletin 250.

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Large 6" x 10" throat opening. For use beside each injection molding machine. Rugged, efficient, and easy to clean. Write for details.

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Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin 250.

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QUICK FACTS ABOUT CUMBERLAND MACHINES

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ROTARY CHOPPER: Versatile heavy duty machine. Cuts thick vinylite slabs. For other applications, request Bulletin 400.

PELLETIZER: Pelletizes plastic material from continuous extruders.

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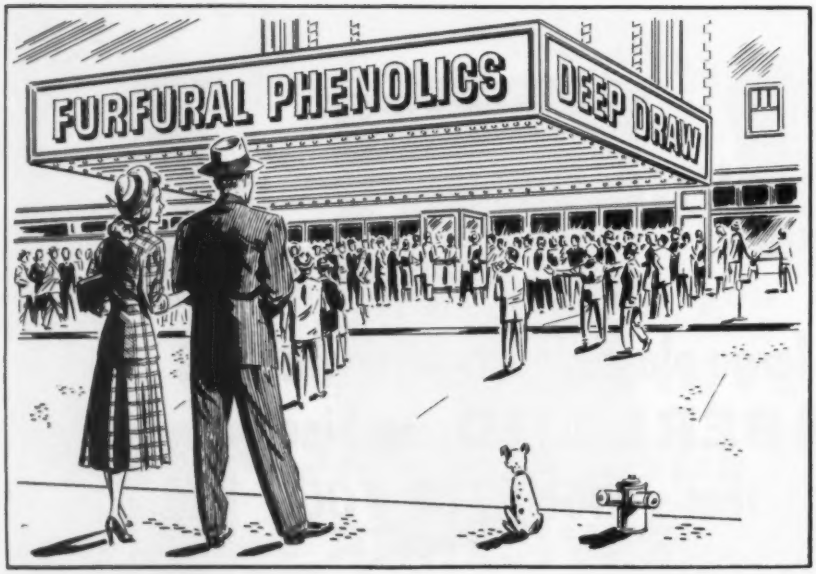

FURFURAL PHENOLICS GAIN IN POPULARITY

as demand for deep draw compounds increases

An important use of furfural-phenolics is to tailor molding compounds of optimum flow—cure ratios for deep draw moldings. The longer flow period achieved with furfural lessens the tendency to precure; it increases the rate of heat transfer in the molding compounds of optimum flow—cure ratios for deep draw moldings. The items. Furthermore the correct rate of flow produces optimum appearance and strength in the finished article.

The Quaker Oats Company does not manufacture furfural-phenolic molding powders but is glad to put you in touch with suppliers. If you would like general information about furfural itself just ask for a copy of Bulletin 201.

The Quaker Oats Company CHEMICALS DEPT.

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In San Francisco, The Griffin Chemical Company In The United Kingdom, Imperial Chemical Industries, Ltd., Billingham, England In Australia, Swift & Company, Pty., Ltd., Sydney In Europe, Quaker Oats-Graanproducten N. V., Rotterdam The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8E, France In Japan, F. Kanematsu & Company, Ltd., Tokyo

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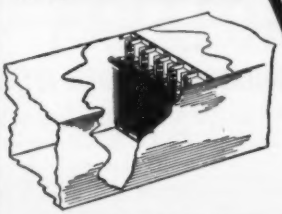
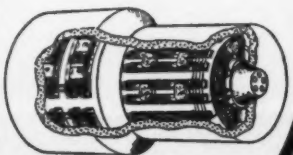
TYPICAL APPLICATIONS



Chromalox Electric Fin-Strip Heaters mounted in air ducts.



Plastic extrusion barrel with Chromalox Ring, Straight and Curved Strip Heaters.

10-50

Easy to Install CHROMALOX Electric Strip Heaters give clean, dependable and accurately controlled heat. They are widely used in platens, dies, kettles, tanks, ovens, air ducts and other applications requiring accurate temperature control and around-the-clock service.

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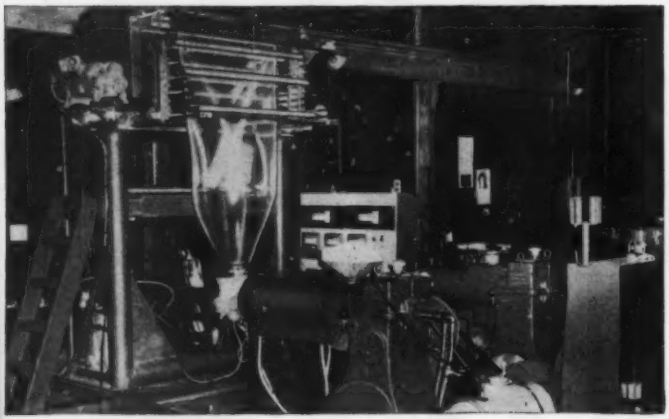
PLASTICS MACHINERY BULLETIN

Reporting News and Machine Design Developments

IN BUSINESS TO **NRM** REDUCE YOUR COSTS

NEW EQUIPMENT EXTRUDES THERMO-PLASTICS FILM AND THIN-WALL EXPANDED TUBING



NRM thin-wall expanded tubing installation with 2½" electrically heated extruder, 8" die and 48" vertical haul-off.

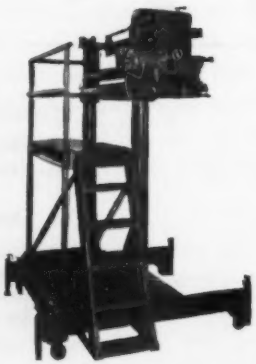
A complete installation for the extrusion of thin-wall expanded polyethylene and PVC tubing for wall thicknesses from .001" up is now available.

Dies of 8", 15" or 20" diameter can be fitted to 2½", 3½", 4½" or 6" extruders. The flattened width of the tubing is dependent on the diameter of the die. The flattening idler roll arrangement of the 48" haul-off can handle lay-flat tubing up to 42" wide. Other designs for tubing up to 66" are also available.

The special single-arm spider die is electrically heated, and has zoned-temperature control which is well balanced.

The vertical haul-off, which can be provided with trimmer knives, has a dual take-up. It is held rigidly in place on retractable jack screws, and easily rolled out of the way on casters.

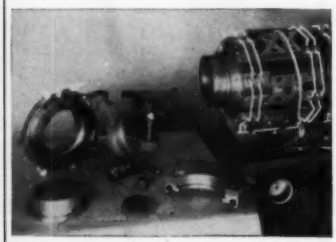
For detailed information, write Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.



NRM 48" vertical haul-off for thin-wall expanded plastic tubing. Has variable-speed drive, including flattening idler roll arrangement, adjustable trimmer knives and dual take-up.

New Nylon Extruder

NRM now offers a simplified rugged split front flange arrangement holding a standard die gate or PVC crosshead which can be removed readily and replaced with a band heater. The split flange is provided with hinge lugs and two swing bolts.



NRM 2½" Model "50" die gate, sub-die, strainer plate and split-type front flange as removed from cylinder front end of a 2½" extruder. A nylon crosshead or nylon die can now be bolted direct to the cylinder face.

When the flange is removed the small *Nylon* die or *Nylon* crosshead is bolted directly to the face of the cylinder. This avoids critical temperature variations resulting from heat losses of the flange.

INDICATES EXTRUDER SPEEDS

With installation of a special tachometer, adaptable to all NRM extruders, you can now have an accurate indication of screw speeds at all times. A tachometer generator mounted on the gear housing over the input shaft is connected to an indicating dial conveniently mounted close to the feed hopper.

For complete details, write Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.

NATIONAL RUBBER MACHINERY CO. General Offices & Engineering Laboratories Akron 8, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J.
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Creative Custom Molding

The parts illustrated above are currently being produced for a new portable tape recorder manufactured by the Webster-Chicago Corp. of Chicago.

Material used is acrylic and each part is decorated by CRUVER'S bas-releef process.

CRUVER

MANUFACTURING CO.

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BRANCH OFFICES

DETROIT MINNEAPOLIS NEW YORK

CLEVELAND ST. LOUIS

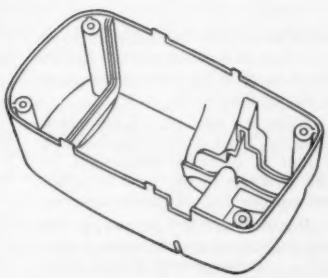
Housing molded with Hercules Cellulose Acetate Moldir Powder by Industrial Plastics Company, Chicago, Illinois.*

IN SELLING, TOO!

HERE is something really new in kitchen tools—the Oster electric knife sharpener. Simple and easy to use, its unique double action quickly puts a factory-sharp edge on any knife, sharpening both sides of the blade at the same time.

In turn, a gleaming-white housing molded with versatile cellulose acetate gives this new Oster product a double selling edge. It *looks* better, and *works* better, too! Handsomely styled, its through-and-through color can't chip, peel, or wear off . . . it has excellent resistance to kitchen oils and greases . . . plus a hard-to-break toughness that spells a long and satisfactory service life.

Whether yours is a household or an industrial product, you may find in cellulose acetate an excellent means of giving it an edge on the competition, both in appearance and performance. Our design and technical staffs invite your inquiries.

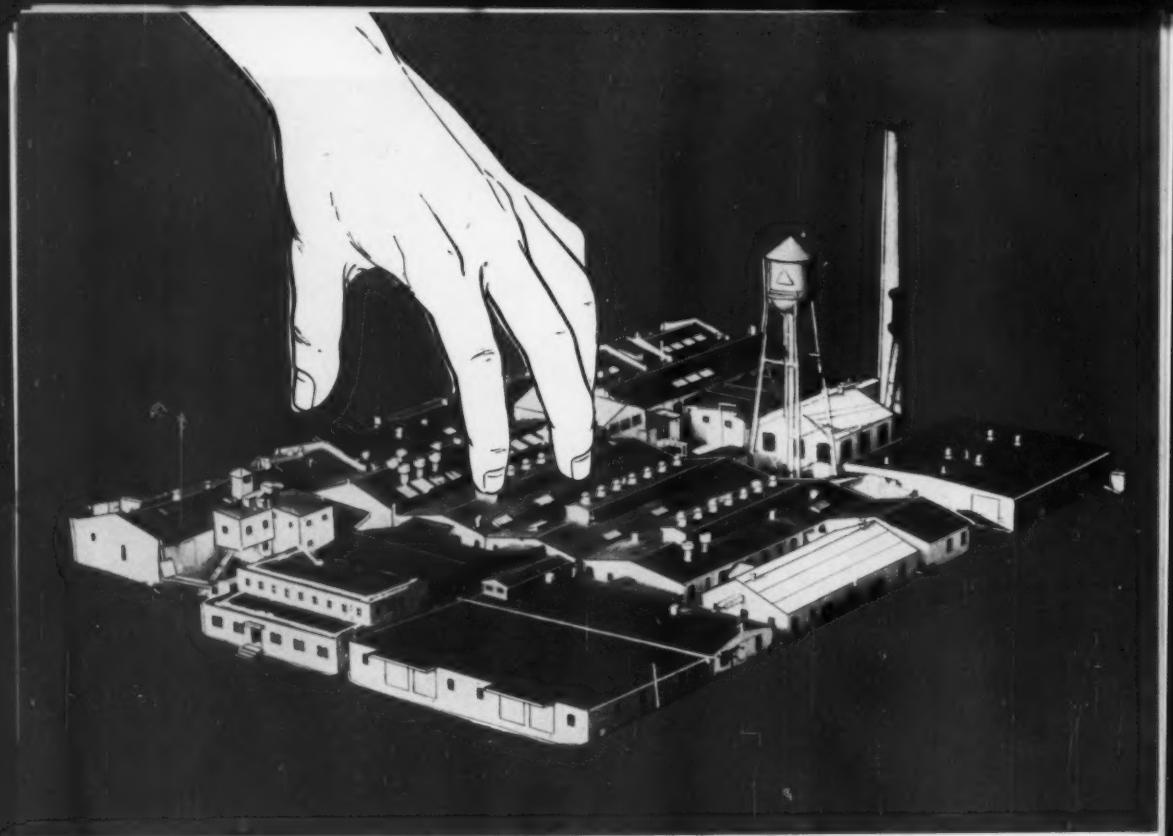


A skillfully constructed die produced this sturdy housing with complex contours and narrow knife blade slots. In addition to other properties obtained, cellulose acetate provided a material which would not resonate under vibration—insuring quiet operation of the completed unit.

***HERCULES POWDER COMPANY** 916 Market St., Wilmington, Del.*

HERCULES Cellulosic Plastics

*TRADE-MARK *Inquiries about the new Oster electric knife sharpener should be addressed to the manufacturer, John Oster Mfg. Co., Racine, Wisc.* CP51-3



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Our engineering people are here for the purpose of advising you on the proper use of molded plastics. The use of this service involves no obligation. Just drop us a line if you think we can be of assistance to you.

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NEW FREEDOM, PENNSYLVANIA

Aico's Complete Plastic Molding Service Includes:

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INJECTION MOLDING for high rate of production . . . low unit cost.

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LOW-PRESSURE MOLDING . . . a relatively new development especially suitable for short runs of large, lightweight pieces.

MANY THINGS ARE BETTER BECAUSE OF

Aico PRECISION MOLDED plastics

A SPECIAL SERVICE TO MODERN PLASTICS READERS, REPORTING AND INTERPRETING THE LATEST NEWS AND DEVELOPMENTS FROM WASHINGTON AND ELSEWHERE AS THEY AFFECT THE PLASTICS INDUSTRY AND THE MOBILIZATION PROGRAM

Modern Plastics BULLETIN

February 15, 1951

NPA Order M-32 and Ethyl Cellulose

You will undoubtedly hear much about order M-32 as time goes on. At present it affects only a certain condition in the distribution of ethyl cellulose, but it is the forerunner of an order soon to be written which will provide priority ratings and allocations for chemicals that are in critical supply.

M-32 as it stands today simply sets up certain procedures and methods by which rated orders for chemicals may be placed, accepted, and scheduled. Its primary purpose is to divide distribution of rated orders evenly among all producers of whatever chemical may be named. But M-32 is only a stop-gap measure which will probably be superseded in a few months by an order similar to the M-300 order that controlled chemical allocations in World War II.

Ethyl cellulose, first chemical to be regulated under M-32, is produced in comparatively small volume. Estimators in the trade place production at about 12 million lb. of flake a year. Ethyl cellulose was a new material at the beginning of World War II and the Armed Services were not too familiar with its possibilities. Eventually, however, it leaped into great prominence for four important applications—proximity fuse heads or nozzles; inhibitor strips to prevent certain types of rocket propellants from burning unevenly; strip coatings for preservation of metallic parts; and certain types of cable lacquers.

Facilities for production of ethyl cellulose have not been expanded since the close of World War II. During the past year, demand for civilian applications far exceeded supply, which has been hampered by a shortage of ethyl chloride. There has not been enough flake produced to supply the need for its use in cable lacquers, phonograph records, dip coatings, inks, and adhesives. The use of flake for molding powder in civilian applications was beginning to zoom upward when the supply was cut, and a large portion was turned over to DO orders. Chief of these uses are for inhibitor strips, proximity fuses, radiosondes, tool handles, and field telephones. Large quantities of the flake are also DO'd for dip coat and lacquer.

Until M-32 was issued, by far the greatest numbers of DO orders for ethyl cellulose were being served on one company, thus harming the relationship of that company with its customers who were depending upon it to supply material for civilian applications. NPA took cognizance of the situation. Order M-32 now decrees that no producer can be required to furnish more than 40% of its ethyl cellulose flake production for fulfillment of DO orders.

A further restriction is that the customer must place his requirements for a DO order at least 15 days before date of delivery in order to prevent upsetting scheduled delivery of civilian orders.

Phenolics

Production of phenolic molding powder declined from 22,200,000 lb. in August 1950 to 19 million lb. in November, according to the latest government figures available. December is estimated to have been even lower, with January up a bit; February production may be from 10 to 20% less than January.

Chief factor in this decline is a lack of raw materials—primarily phenol, but there is also a steadily growing shortage of formaldehyde. The situation was worsened further by the Thanksgiving storm in the Midwest which resulted in six or seven days of downtime in many plants furnishing raw materials. Facilities were also being overhauled in some plants during part of this period. February is nearly always lower than other months because it is a short month; the railroad strike will, of course, contribute to the lowered production rate.

The supply line might be described as "jerky" because producers are living from hand to mouth. There is no backlog of chemicals on hand, where there is usually a supply that might last for months. As a result, any emergency today—such as a storm or a strike—brings about an almost immediate curtailment of supply, since there is no surplus to pour into the kettles.

Suppliers still expect that there will be a reduction in demand for phenolic moldings about May

when the cutback in television sets, automobiles, electrical appliances, and other phenolic-using products really begins to take effect. It was originally expected that this decline would show up in March, but so far there has been no sign of any reduced demand; it is certain that it will not appear until inventories have been rebuilt. The television industry must certainly cut its output of consumer sets soon. One or two producers have already announced complete discontinuation of civilian television sets.

The switch from civilian to government business in phenolic molded products may take a long time. Veterans in the industry point out that phenolic molding in 1942 declined to a considerable extent when civilian production was curtailed, and didn't boom again until late 1943 when war business really began to take hold. Not only must there be a certain amount of searching around, plus time for salesmen and procurement men to get together, but there must also be a lot of retooling. The situation today, of course, is not exactly parallel with 1942–43, because the government is striving desperately to keep civilian business going at as high a rate as possible, and the use of phenolics by manufacturers who cannot obtain other materials may also spread. For example, even though bottle caps consume large quantities of phenolic today, they are likely to consume still larger volume when the tin shortage becomes more evident. The percentage of washing machine agitators produced in phenolic rather than aluminum will probably grow; thus, the total amount of phenolic used in washing machines may become greater than it ever was, even though the total number of machines is reduced. Along another line, one producer says he knows that a considerable number of old molds are being taken out of stock for such items as desk letter trays, ash trays, and many other things that are affected by the metal shortage. Phenolic telephone parts are still going strong, and a new large phenolic container for silverware was recently announced.

DO orders for phenolic molded parts have grown from about 10% of the total in December to 17 or 18% at present. Among the items are phosphorous bombs, booster tubes, parts for flame throwers, and electrical equipment. These were all contracts let under advertised bids by arsenals. The moldings to be used to fulfill contracts let by negotiated bids have not yet been announced.

Phenolic production for laminating resin increased steadily from 6 million lb. in August to 7,300,000 lb. in November. This resin has, of course, been affected by the material shortage since that time, but 1950 may well have been the greatest volume year for the laminators. One reason for the great increase was the many laminated parts used in television sets. The record indicates that laminators can get into war-time business much more rapidly than molders. In the first place, the amount of laminates sold to the government in peace-time is reasonably high. In the second place, laminators don't require as much tooling-up as molders; many of their standard pieces can be used in aeronautic and electronic equipment.

Formaldehyde

Formaldehyde is an important ingredient in phenolic, urea, and melamine compounds. Consumption of 910 million lb. in 1950 broke all records, and more could have been used if it had been available.

Production capacity has grown enormously since World War II, when formaldehyde was continuously in critical supply. In 1949, production was at the average rate of about 540 million lb. a year, but in 1950 there was one month when production was equal to a rate of 913 million lb. a year. In September and October of 1950, the consumption rate was as high as 1100 million lb. a year.

Principal uses for formaldehyde in 1950 were 310 million lb. for phenolic compounds; from 310 to 340 million lb. for urea and melamine compounds; 135 million lb. for pentaerythritol. The latter is now used extensively in alkyd resins to replace glycerine, which is being channeled into explosives.

The conversion factor for phenolic compounds is about 1.1 lb. formaldehyde for 1 lb. of phenolic. The conversion factor for urea glues and molding powder varies from as little as 0.6 to as high as 1.8 lb. of formaldehyde.

The possibility of getting more formaldehyde depends largely on the availability of methanol from which it is produced. Most methanol comes from natural gas, and one of the reasons for a shortage—even if only temporary—was the severe winter when Texas gas fields were tapped so heavily to provide heating fuel.

Normally, 30% of methanol production has been used for formaldehyde, but in 1950 it is estimated that the percentage went up to 40. The big use for methanol, aside from formaldehyde, is in anti-freeze, which required about 23 to 26% of the methanol output in 1949. The amount of methanol and glycerine used in anti-freeze compounds is tremendous, and in emergency times there will always be juggling between them in order to supply this huge market, a great part of which will be military. Methanol also boosts the rating of fuel used in airplanes for jet take-offs; it was used by the Germans for fuel in their World War II rockets.

Acrylics

About 75% more acrylic molding powder is now being used by molders than one year ago. Producers assert that demand is from 25 to 50% above supply.

Acrylic molded pieces are predominantly for civilian consumption, with automotive parts by far the largest outlet. It is therefore probable that the impending cut in 1951 automobile production will make more acrylic available for other molded items, but it

may be some months before the switch is noticeable.

Other civilian outlets for acrylic molding and extrusion material include industrial name plates, lighting fixtures, gages, dials, extruded rod, and pearlescent beads.

In World War II there was only small production of acrylic for the military in such applications as lenses and reflectors. The possibility of extruding acrylic molding powder into corrugated sheet form for glazing in prefabricated buildings holds potential military value. Acrylic dials for instrument panels will soon need a substantial number of DO orders.

Acrylic sheet can be produced by Rohm & Haas and Du Pont at about the same rate as during World War II despite the fact that Du Pont's Leominster plant has been leased for other purposes. That rate of operation would mean considerably more than twice as much sheet as was produced in 1949. Today's sheets for aircraft are much larger and thicker than those of 1941–45.

Civilian demand for acrylic is nowhere near being satisfied, although fabricators are still getting just as much as at any time in the last two years. Military demand is constantly increasing, and if the government starts building 50,000 or more airplanes a year, there will be very little acrylic sheet left for civilian consumption. It is true that bombers no longer have blisters or turrets since guns are radar-aimed, but fighter planes are now equipped with much larger acrylic canopies than formerly—some of them 8 ft. long—and bombers use acrylic bombardiers' noses and sighting domes. Helicopters will also be on the scene in much larger quantity than in 1941–45, and each of them uses a larger quantity of acrylic than a combat airplane.

It is quite possible that new facilities will eventually have to be built for acrylic sheet to service the Armed Forces. No shortage of raw materials for producing acrylic monomer for military purposes is foreseeable at present.

Will Chlorine Controls Affect Vinyls?

The impact of the Korean war, coming on top of the early 1950 boom in consumer purchasing, resulted in chemical shortages that almost no one would have believed possible a few years ago. It was no particular surprise that benzol, phenol, styrene, phthalic anhydride—all vital to plastics—should run short in a period of high demand. Informed persons have been pointing out that danger ever since 1946. But shortages in sulfur, chlorine, formaldehyde, acetylene—here was something different. Anyone who predicted a shortage in any of these four basic chemicals a year ago would have been looked upon as a gloom peddler. All are at record production today, yet are so scarce that all are now, or soon will be, under government restriction.

The first of this group to come under official government regulation was chlorine, which is now restricted under NPA Order No. M-31 of Jan. 23, 1951. The manner in which chlorine is under control indicates that the government does not intend to go "all out" on control of any material until the major portion of production is allocated for defense goods. The government's attitude seems to be that more capacity is coming to help remedy the situation.

The "queer" part of the order is that it regulates only "marketable production" of chlorine. The chlorine industry is divided into captive and non-captive plants. The so-called captive plants use most of their chlorine in the manufacture of other products. Thus, if a producer of chlorine, who also makes vinyl chloride monomer, chooses to use his chlorine in other products which show a more profitable return, there is nothing to prevent him from so doing. His captive production is not subject to DO orders.

Order M-31 reads, in part:

> ". . . No producer shall be required to accept rated orders for shipment in any month of a total tonnage of chlorine in excess of 10% of his scheduled 'marketable production' . . .
>
> " 'Marketable production' means that portion of chlorine which remains for sale in the hands of a producer after deducting the amount of chlorine which he consumes in his other operations and after deducting the chlorine which he sells and delivers by pipeline."

The order is generally interpreted to mean that no chlorine producer shall be required to deliver more than 10% of his "marketable production" for DO orders plus that required by public or private enterprise for water purification or sewage treatment. For this public health purpose no more chlorine need be provided than was used in 1950, which was about 1% of total production. At present, the amount of chlorine used for defense orders is estimated to be 3 or 4% of the total.

Vinyl chloride monomer production at today's going rate requires an estimated 7 to 8% of chlorine production. To give an idea of the importance of chlorine to the chemical industry, here is a partial Tariff Commission list showing the volume of products requiring large amounts of chlorine:

Vinyl chloride and vinylidene chloride monomers	243,618,000 lb.
Ethyl chloride (used for tetraethyl lead, ethyl cellulose, neoprene, silicone, etc.)	306,509,000 lb.
Carbon tetrachloride	197,046,000 lb.
Chlorinated paraffin	16,769,000 lb.
Chloroform (for solvents)	13,684,000 lb.
Other halogenated (chlorinated) hydrocarbons	832,100,000 lb.

All the products listed consume huge quantities of chlorine, yet additional huge quantities are required for many other purposes including metallurgy, textile and paper treatment, disinfectants, etc.

(*Continued on next page*)

Chlorine production is estimated at nearly 6000 tons a day with demand well above this amount. The estimated "marketable" chlorine is from 2500 to 3000 tons. Production of all chlorine has increased from about 4000 tons a day in 1947. It is possible that new capacity totaling 1200 tons a day will come in during 1951 or early in 1952.

Although the percentage of chlorine production used for vinyl is comparatively small, the total chlorine demand is so great that a producer cannot divert a few thousand pounds more to vinyl without cutting into his other markets or even his own products that require chlorine. Therefore, unless the newly planned chlorine capacity comes in quickly, it seems unlikely that vinyl production can be greatly expanded in the near future by any company that does not have a contract to take care of the increased need for chlorine which would result. There will, of course, be plenty of chlorine for vinyl used in DO orders, and, strangely enough, it may even be possible for a processor to obtain more vinyl resin now than he did before, if he has a large DO order.

The reason is that some producers of vinyl will now allocate resin to their customers for DO orders separately—that is, when they are convinced the customer hasn't ordered resin for the same DO from another supplier. Previously, resin for DO's was included in regular allotments. But if chlorine producers cut vinyl producers 10% or 5% or 3% or whatever is found necessary after filling DO orders, the vinyl producer will naturally have to adjust the resin allotments to his customers. The vinyl supplier will thus furnish resin to a customer to meet DO requirements plus whatever percentage of left-over is available, according to the customer's purchasing record. Under this arrangement, a customer may get, say, 90% of last year's purchases, together with whatever he needs for DO business.

Current Vinyl Supply Situation—The future for vinyl chloride continues to present a more complex problem than any other plastic. It is so thoroughly mingled with chlorine, acetylene, phthalic anhydride, slow-to-develop DO orders, and consumer buying whims that any prophecy could be knocked cockeyed over night.

In addition to raw material shortages, the industry faces an unusual situation because of its diversity. The majority of all vinyl finished products is consumer goods rather than industrial goods. Film and sheeting is by far the largest part of this consumer goods output. There has been no government demand for a sizable portion of this type of material, and unless certain experiments prove the superior value of vinyl above other materials, there are not likely to be enough government orders to take more than a small percentage of the output of the industry's calendering facilities.

On the other hand, the government demand for vinyl-jacketed wire, vinyl-coated fabric, and possibly cast or very thin film (2-mil or less) for packaging will undoubtedly continue to rise in proportion to the size of the defense program. Unless vinyl resin production can be increased, it is probable that the ever-growing demand for wire coating and fabric coating will cut into the amount of resin available for civilian film, unsupported sheet, and that part of the coated-fabric market which is not allocated for government use.

The effect that this juggling will have on the amount of resin available for drapes, curtains, tablecloths, etc., will not be clear until the industry learns how the chlorine order is going to affect its supply. On top of that situation, the supply of phthalic anhydride for plasticizers has suddenly become even tighter than it was a few months ago; even if a calenderer obtains resin, his operations may be curtailed by lack of plasticizer. The Barrett Div. of Allied Chemical & Dye Corp. will have a new phthalic anhydride plant ready late this year or in early 1952, but that's of small immediate comfort to a man with a $250,000 calender layout which is working only part time because he can't get enough plasticizer.

Vinyl chloride producers were off to a good start in January and February of this year, with the first month's production believed close to the record figures of last year's highest production months and with February off only slightly.

The vinyl inventory situation is also murky. Several surveys made last fall by various individuals indicated that film merchandise was heavily stocked. Film and sheet producers were operating at as full capacity as was possible with the raw material obtainable—in fact, at a higher rate than ever before. But the retailers were not moving the goods as fast as it came off the calenders.

By the middle of last November it was believed that inventory was near 10% in excess of retail customer demand. This inventory may have been in finished goods, unprinted film, or resin in the calenderer's hands—probably a combination of all. It is expected that any surplus will disappear by March due to the usual heavy demand every spring.

After that, the supply of vinyl for commercial production through summer at least will be tied very closely to availability of raw materials. Customer demand should remain heavy because vinyl goods will be generally low in cost by comparison with other materials, and housewives will have the money to buy. Nearly all vinyl producers are planning expansion; one especially big project is scheduled to start operating in June. But chlorine is the key for the time being. Users of vinyl will watch closely for changes in the chlorine order. If the government requires chlorine producers to increase the 10% of production now listed as the maximum set-aside for DO's or begins to limit the amount of chlorine that can be used in specific civilian products, the outlook for more vinyl film to be used for civilian purposes will not be encouraging.

MODERN PLASTICS
VOLUME 28 MARCH 1951 NUMBER 7

The Promise of REINFORCED PLASTICS in Defense

First of a series of three articles covers the probable supply situation in resins and glass reinforcements, and lists basic unclassified defense applications

GLASS reinforced polyester plastics were among the proudest and most promising babies born to the plastics industry in World War II.

These materials, high in strength-weight ratio, soared to prominence by 1944 in airplane doors, wing parts, radomes, auxiliary fuel tanks, helmets, and containers. At war's end they were in pilot production use in the manufacture of body armor.

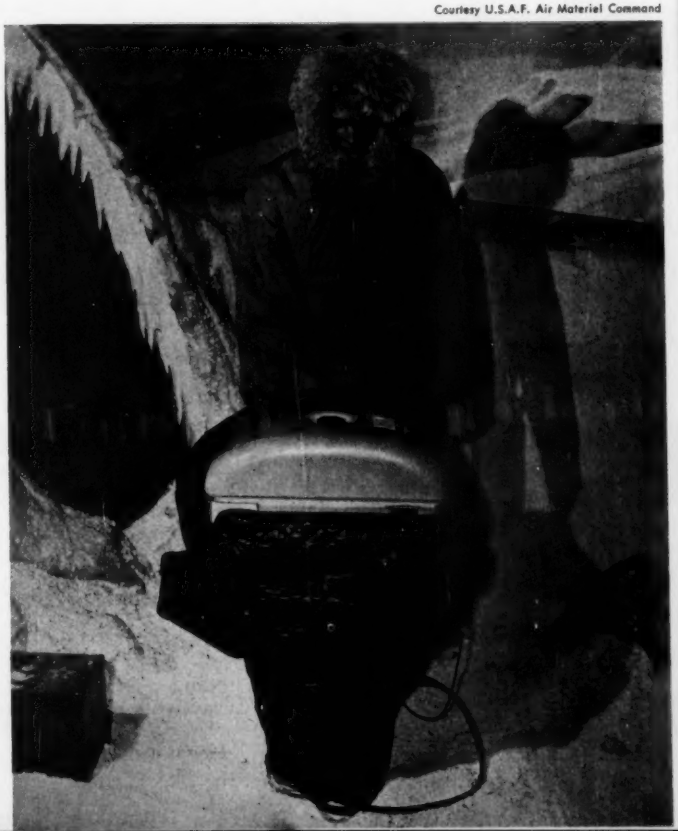
In 1945, estimates show that about 6 million lb. of polyesters were made for "low pressure molded laminates," as these reinforced plastics were then called. And the super-enthusiasts that have always been identified with these materials were predicting a fabulous peacetime future for them.

But something happened. Rather, many things happened, all related to economics. War-time costs were too high for most civilian markets, World War II production methods were too slow, war-time specifications at those costs were literally too good for many consumer applications. By 1949, volume of polyesters was down to 1,850,000 pounds.

By 1949, however, mass production methods, lower-cost materials, improved engineering, and salesmanship had begun to beat the adverse economics of reinforced plastics. Between 8 million and 9 million lb. of polyesters were sold in 1950—almost all of it going into civilian products.

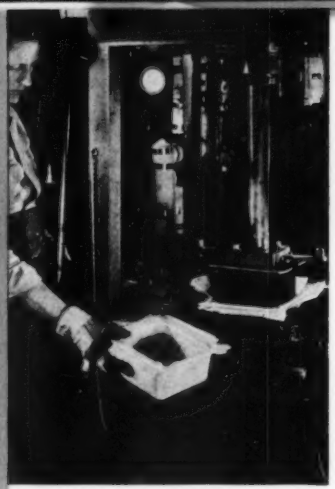
Just when the pendulum of popularity was swinging toward public favor for reinforced polyesters, war broke out in Korea. Then came the huge program of re-mobilization. And now comes the question: what part will the most notable plastics

Courtesy U.S.A.F. Air Materiel Command



Strength, resistance to temperature extremes, and light weight were reasons for selecting reinforced plastics for the cover of the film magazine of this aerial reconnaissance camera. The curved cover is molded of Fiberglas reinforced Laminac resin by Laminated Plastics, Inc., for Ryan Industries, Inc.

Molding reinforced plastics, using a hand layup over a male mold. Pressure is applied by drawing a vacuum on a vinyl film female. Room temperature curing resins are generally used



Rubber male with metal female in compression press molds tailored glass mat

No pressure method of making a boat. Molds may be wood, metal, concrete, or (as in this case) reinforced plastics themselves. One well finished surface is produced by this method

Metal-to-metal molding of preformed material has become popular within past year

Photos courtesy Owens-Corning Fiberglas Corp.

"war baby" of World War II play in the present program?

There are several related questions. How have these materials changed since 1945 from the standpoints of cost, function, and ease of use? What improvements in engineering and techniques have there been, and how may these affect defense applications? How much more know-how exists today than five years ago? Finally, how much resin and reinforcement will be available?

Provided styrene monomer is allowed from the synthetic rubber program, it is quite possible to produce up to 27 million lb. of styrene-based polyesters this year in existing facilities; additional facilities could be brought in to double that production in 1952. Resin men estimate that approximately 5 million lb. of other resins suitable for glass reinforced plastics work will be produced in 1951 and that this figure, too, could be tripled in 1952.

Reinforcement is a vastly different matter. On an average, reinforced plastics use 2 lb. of resin to 1 lb. of glass. At present, fibrous glass production for plastics reinforcement—yarn for fabrics, mat and chopped strands, rovings, and multiple-end wound materials—is running at a rate of about 600,000 lb. per month or 7 million lb. a year. Planned expansion to come in by late 1951 should double this output. By the end of this year we could have 2,500,000 lb. of polyester resins a month and about 1,200,000 lb. of fibrous glass to reinforce them. Expansion of glass production beyond that point in 1952 and later years will depend on many factors now unassessable, although the prospects are good.

Progress in Materials

The first unsaturated polyester resins developed in 1942 were de-

signed to be cast as replacements for acrylic which was then in very short supply. Their possibilities in molding and laminating, especially for work on large pieces, became obvious because of the fact that they would polymerize at low pressures without giving off water or other volatiles during cure.

The need for the development of these resins and development of techniques for molding them was first discussed by Dr. Irving Muskat, president of Marco Chemicals, Inc., Sewaren, N.J., and J. D. Lincoln, vice president, Virginia-Lincoln Corp., Marion, Va., before the Pacific Coast section of S.P.I. in February, 1943. In May, 1944 MODERN PLASTICS presented a group of articles showing the use of these materials in airplane construction at Patterson-Wright Field, Dayton, Ohio. The first advertisement offering polyester resins for reinforced plastics work was run by Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio, in our September 1944 issue.

In 1944, and for almost three years thereafter, the polyesters were decidedly incomplete materials. They required special hit-and-miss catalyzation in the plants of the molders and trial-and-error methods to determine the type of resin most suitable for the application, the pressures to be used, the pressing methods, and the length of cycles.

Preferred Reinforcement

Even the early experimental work by the A.A.F. and others showed that fibrous glass was a reinforcement most suited for use with these resins. Glass fiber possessed the properties of strength, chemical resistance, controllable modulus of elasticity, and moisture resistance necessary for applications where reinforced plastics would compete with metal. Being capable of successfully competing with metal, the materials later took markets away from wood, ceramics, and even from other kinds of plastics.

In World War II, glass in fabric form was used as reinforcement because that was the only form then in existence. In the light of today's economics, glass fabric was fantastically expensive for this use. The glass had to be treated with a starch coating to facilitate its weaving, and this coating had to be burned off before the glass could be molded. The hand tailoring and pat-a-cake layup on mandrels or in molds, the cellophane separators, the rubber bags and other paraphernalia, and the fact that the molder had to mess around with sticky gunk which was poured from pitchers, made the reinforced plastics molding and laminating plants among the most unpleasant places to work.

Such was the brilliant plastics baby of World War II. Only its parents, the makers of glass and resins and the molders, and its godparents, the military development men, could love it! The present stalwart and growing reinforced plastics industry bears little resemblance to the baby, but it is still far from maturity!

Plain cost economics forced Fiberglas engineers to develop mats which in the majority of applications could replace woven glass fabric at less than one-third the cost. The mats have a physical advantage in that they have no sizing to be burned off. Of course, modern glass fabrics do not require burning off by molders and laminators: it is done for them.

Following the development of mats came that of preforming, whereby chopped strands of glass with bonding resin are blown or sucked onto perforated metal forms, then given a heat treatment to jell the binder, then impregnated with resin and molded. Most recent development here is the use of continuous glass rovings, chopped on the job. This process makes for a much cleaner and less costly operation.

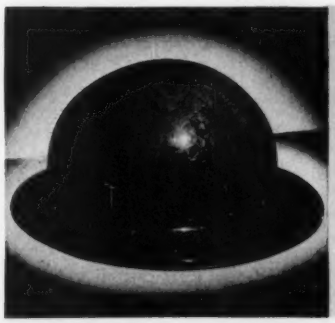
Preforming was fathered by the hat industry in its felting process, but in reinforced plastics it has progressed to a point where several different types of preform machines are used for different sizes and kinds of moldings. Indeed, as will be shown later in this series, combinations of fabric and mat and preform shapes are being used today in single moldings.

New Glass Reinforcements

Newest factors in glass production for this field are oriented and unidirectional mats and the multiple-end wound fibers. The unidirectional or parallel strand materials, especially, make possible the tailoring of reinforcement to the strength requisites of the moldings at much lower costs than by use of woven glass fabric. The multiple-end wound materials are used chiefly in the fishing rod field, but they would appear to have possibilities in the continuous manufacture of reinforced plastics pipe, rod, and tube.

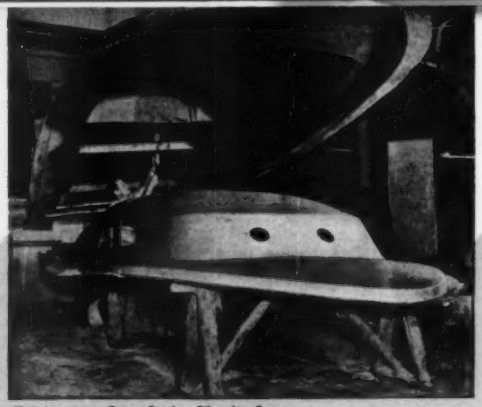
Four major firms are now in the glass reinforcement field. Owens-Corning Fiberglas Corp., Toledo, Ohio, supplies yarns to weavers, bonded random mats of various kinds to molders, chopped fibers and rovings to preformers, multiple-end wound strands, and unidirectional mat. Glass Fibers, Inc., Waterville,

Photos courtesy Owens-Corning Fiberglas Corp.



Left: In the early days of World War II, reinforced plastics helmets were handmade by tailoring glass fabric over a form. Right: Newer method of making such helmets makes use of preforms

Glass mat for reinforced plastics boats by Bostic Boat Co. being cut to shape prior to layup



Photos courtesy Owens-Corning Fiberglas Corp.

Entire deck of boat, molded in one piece, is removed by inverting the mold. Deck then joins the hull, as in photograph at the right

Ohio, supplies several types of glass yarns to weavers for weaving into glass cloth for use in plastics reinforcement and now has available for direct sale to the plastics industry bonded mat up to 60 in. wide. This mat is unidirectional, reinforced with parallel strands. Glasfloss Corp., Hicksville, N.Y., produces for molders an oriented unidirectional mat bonded with several different kinds of resins and supplied in sheets 4 by 12 ft., as well as flat rovings for either winding or preform chopping.

Perrault Glass Fibers, Inc., Tulsa, Okla., with a glass plant at Newport, Ark., is offering reinforced plastics molders and laminators a unidirectional oriented mat in sheets 12 by 12 ft. which may be expanded by molders on special devices to form reinforcing mat for tube, layup, and drawn work. The close-fibered unexpanded mat is delivered with binder applied.

Available Resins

In the resin field, technical progress has been even more spectacular. There are today 12 main manufacturers of polyesters. Most of the resins are styrene based and all are produced to accurate specifications as to catalyzation and cure.

Various of these resins will cure at pressures from zero to well over 1000 p.s.i. Some have special properties in chemical and heat resistance, dielectric quality, flexibility, adhesion, and flow. There is a resin for every purpose, and it is possible to order that resin according to the requirements of the application, the type of equipment in the plant, the kind of reinforcement to be used, and the economics of the job.

American Cyanamid Co.'s Laminac resins have been especially designed for blending to get intermediate properties. This company has added no new resins within recent months (see MODERN PLASTICS, Oct. 1949, page 72), but has put further development work into its rigid, fire-resistant materials.

Selectron resins produced by Pittsburgh Plate Glass Co., Pittsburgh, Pa., were completely standardized for mass production two years ago. The company has added new numbers to its "5000" series to provide improved wetting of parallel-bonded or unidirectional mat.

Other resins that have come through the development stage in the past year include Selectron 5081 and 5083. The former cures with less exothermic heat and is especially good for making relatively thick sections; the latter was developed to meet the need for a higher flexural strength product.

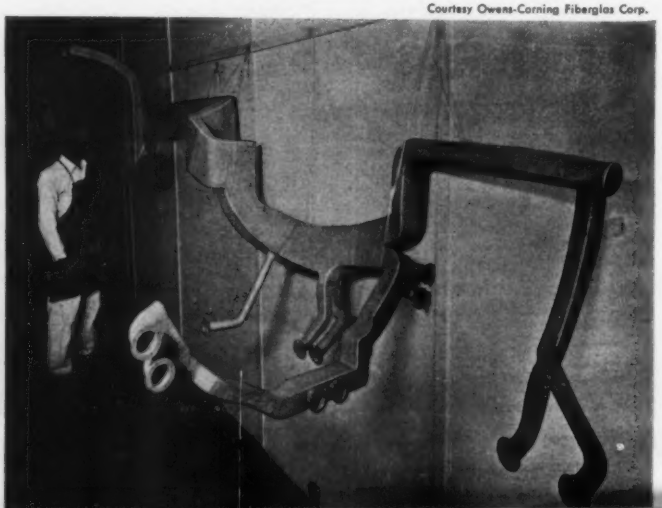
Selectron paste resins 5404 and 5405 are being used to pre-impregnate Fiberglas mat and cloth for flat or roll storage before final use. The shelf life of these impregnated reinforcements is stated to be several months.

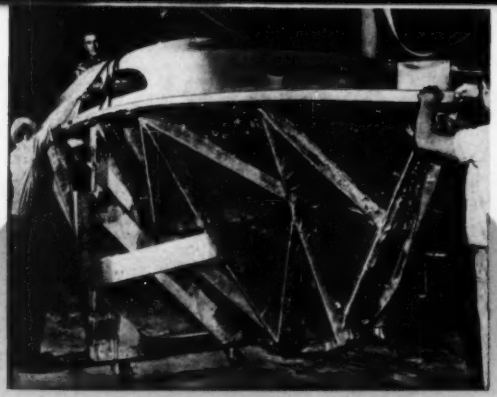
Pittsburgh Plate Glass has recently put a lot of work into light stabilized resins which will remain non-yellow in sunlight.

Rohm & Haas Co., Philadelphia, Pa., in its Paraplex "P" series re-

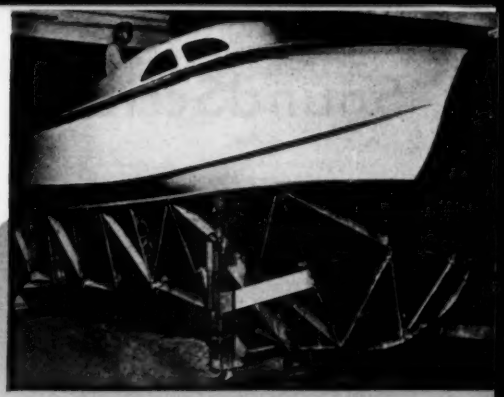
Complicated aircraft duct-work produced from glass cloth reinforced plastics. These components, fabricated in segments by hand, are assembled with polyester adhesives

Courtesy Owens-Corning Fiberglas Corp.





With hull still in its mold, deck is lowered into position. Bonding resin applied to edges holds the two together without use of pressure



Finished seamless boat being hoisted out of the hull mold. Complete boat is then baked several hours at about 200° F.

cently introduced a resin to produce immediate jell for molding mat under pressure. The three standard grades in this series—P-43, P-43 HV, and P-13—can be blended to give any desired degree of flexibility, toughness, viscosity and cure speed. P-43 HV is merely P-43 with less styrene and therefore has a much higher viscosity. High viscosities are desirable for reducing run-off in a mold prior to gelation; preventing pigments and fillers from settling; and to enable build-up of resin films on the surface to increase abrasion resistance.

Paraplex P-13 is a flexible resin and is generally accepted as one of the most flexible polyesters available. It will not increase appreciably in rigidity upon aging.

The Vibrin resins produced by Naugatuck Chemical Div., U. S. Rubber Co., Naugatuck, Conn., were designed for special use in continuous production of polyester-paper laminates. A new water-white polyester has been added to the Vibrin line which guarantees a clear laminate with exceptional chemical and ultra-violet resistance when used with glass reinforcement.

Marco Chemicals, Inc., which has specialized in laminating resins for large pieces molded at very low pressure, recently introduced two new resins. One of these, MR28C, will cure tack-free at room or elevated temperature and can be applied in thin film by brushing or spraying. It has been useful in applying to molds and then molding over it to give improved surface to finished pieces. Cellophane and other barriers are eliminated by this resin, and ovens are not needed for cure. The other new Marco product is a heat-resistant resin with improved adhesion properties and better retention of full strength at elevated temperatures.

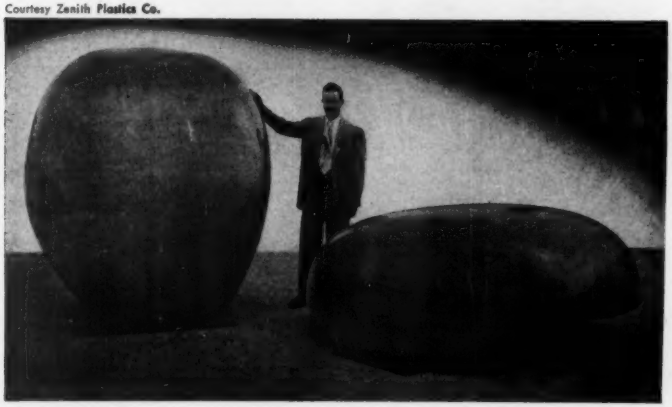
Plaskon Div., Libbey-Owens-Ford Glass Co., has been concentrating on polyesters for use in reinforced plastics where the ratio of glass to resin is high. Plaskon's diallyl phthalate polyester resins are reported to be very popular in fishing rod manufacture and to be quite effective with unidirectional mat or parallel-strand materials.

A new line of solid alkyd resins called Atlacs was recently introduced by Atlas Powder Co., Wilmington, Del., and described on page 174 of MODERN PLASTICS, February 1951. One resin contains no solvent or diluent, but may be mixed with styrene, diallyl phthalate, or any other suitable monomers. The resin cures with no after-odor or taste and is declared to give an improved surface finish. The heat resistance and electrical properties are stated to be exceptional. Another new resin is a solid powder precatalyzed with benzoyl peroxide and is especially adaptable as a thermosetting binder. Both of these resins cure with no after-odor or taste and are declared to give an improved surface finish. Their heat resistance and electrical properties are stated to be exceptional in nature.

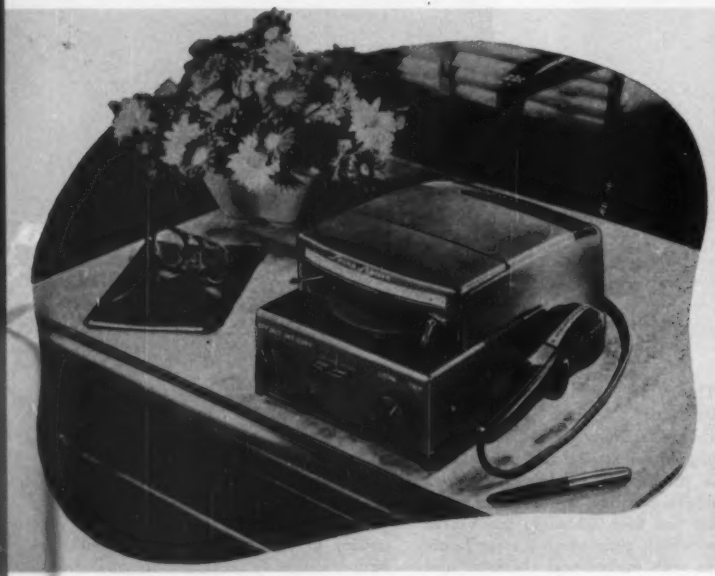
(*Continued on p. 146*)

Two examples of huge radomes currently being produced from glass reinforced polyesters. The radome at the right has been given a rain erosion-resistant treatment

Courtesy Zenith Plastics Co.



SoundScriber Uses More Plastics



A variety of plastics materials (see tabulation on opposite page) contribute to more efficient operation and greater fidelity of reproduction in portable dictating equipment

Courtesy Tennessee Eastman Co.

Microphone housing and its switch are molded of shock-resistant cellulose acetate butyrate

AS the chart at the top of page 61 indicates, six different plastics are used in the Tycoon portable dictating machine and listening device made by The SoundScriber Corp., New Haven, Conn. The parts made of plastics range from knobs and switches to such important components as the recording disk and the new Duette listening device.

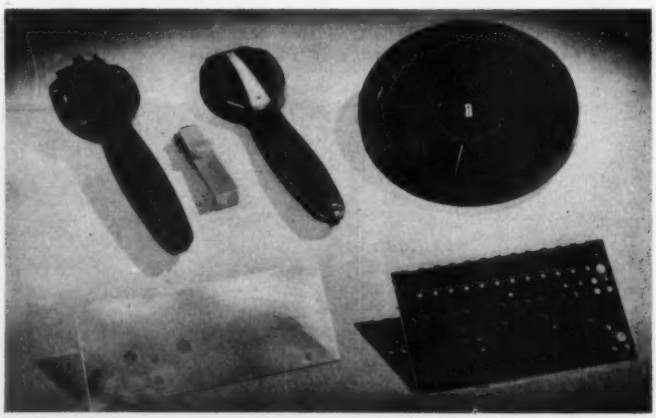
The Duette was developed in response to the demand for a listening device with excellent tone, good appearance, noise exclusion, and comfort when worn for long periods.

In order to make the unit more comfortable by lightening its weight, as many parts as possible were eliminated from the part of the unit which is worn by the listener. Thus the Duette is unique in that the electrical part of the unit is plugged into the transcriber instead of being a part of the ear piece.

Vinyl Sound Tubes

In order to make this design possible, it was necessary to provide a means of transmitting the sound from the electrical unit to the listener's ear. This long thin transmission line would not have been possible with rubber tubing because of the excessive sound losses which would occur. But the sound is transmitted efficiently by an extruded vinyl tube.

The ear pieces themselves are shaped like question marks. They slide smoothly over the outside of the ear with the flat portion against



Plastic parts in machine include: top—microphone housing and switch, left; phenolic turntable shell, right; bottom—vinyl light shield, left; phenolic amplifier card, right

the ear opening so as to exclude outside noises. Each ear piece is a hollow channel made up of two molded phenolic parts cemented together. Sound is conducted through the channel from the end of the vinyl tubing to a hole opposite the listener's ear opening.

The record disk, which has been a standard application since 1940, is cut by SoundScriber from green Vinylite sheet material furnished by Bakelite. The sheets are press polished to mirror smoothness and then coated by SoundScriber so as to minimize surface noise and eliminate any tendency to tear during embossing. The end result is a high quality disk with light weight, flexibility, permanency, and erasability. A translucent light shield is also blanked from Bakelite vinyl sheet.

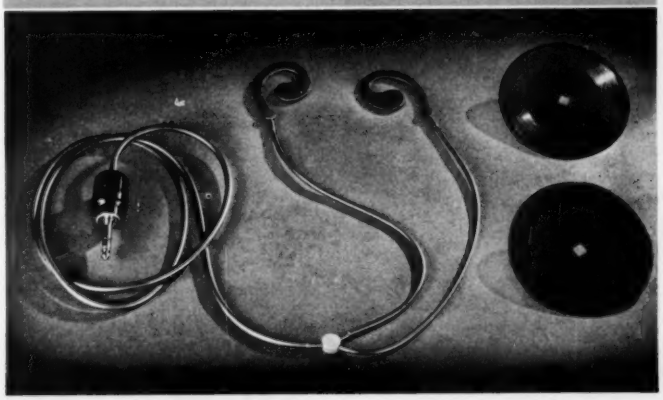
The microphone housing of the Tycoon and the switch which fits into the housing are molded of Tenite II cellulose acetate butyrate. This material was chosen for its appearance, feel, durability, and light weight.

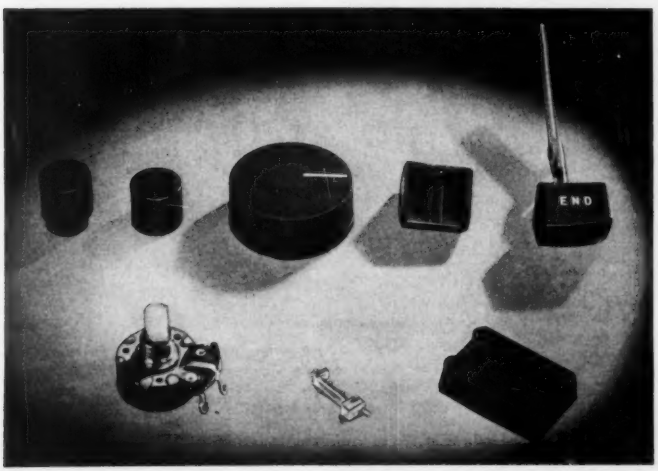
The amplifier card on which subminiature tubes are mounted is a high pressure phenolic-canvas laminate. This material is used because of its excellent insulating properties, high mechanical strength, and ease of punching.

Perhaps the most unusual application of plastics in the Tycoon is the volume control shafts. These shafts are nylon extrusions and therefore are insulators as well as being sturdy and light in weight.

PLASTICS PARTS USED IN DICTATING MACHINE

PART	MATERIAL	MANUFACTURER
Microphone casing	cellulose acetate butyrate	Waterbury Companies, Inc.
Dials and knobs	cellulose acetate butyrate	Waterbury Companies, Inc.
Playback case	molded phenolic	T. F. Butterfield, Inc.
Amplifier card	phenolic canvas laminate	Spaulding Fiber Co., Inc.
Frame for playback coil	acrylic	Waterbury Companies, Inc.
Volume control shaft	extruded nylon	Clarostat Mfg. Co.
Turntable shell	molded phenolic	General Electric Co.
Duette earpiece	molded phenolic	The Murdock Co.
Duette tubing	extruded vinyl	Jessal Plastics, Inc.
Duette electro acoustic transducer	molded phenolic	The Murdock Co.
Light shield	rigid vinyl sheet	SoundScriber
Record disk	rigid vinyl sheet	SoundScriber

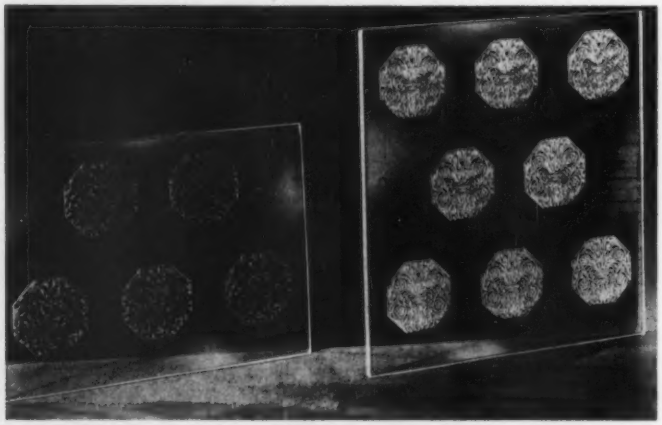




Above, left: To permit new design in listening device—which plugs into the transcriber—extruded vinyl tube, offering good sound conduction, was chosen for transmission line. Phenolic earpieces, center, shaped like question marks, are molded in two parts and cemented together. Right: Record disks are cut from green rigid vinyl sheet

Dials and knobs of dictating machine are molded of cellulose acetate butyrate. Volume control shaft (at bottom left) is extruded of nylon for insulation and strength. Tiny acrylic frame for playback coil is at bottom center

Deep Embossing With Controlled Heat



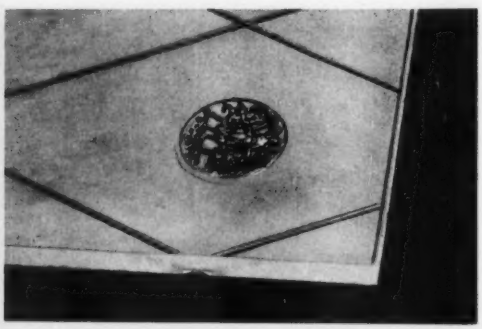
Front and back views of deep embossed acrylic panels showing how a single die can be repeated many times on large sheets. Color has been added by spraying the embossed areas

Many decorative applications are possible with new deep embossing technique. This acrylic sheet, shown from front and rear, is destined for use in an advertising display

WHAT is claimed to be a new method for deep embossing of acrylics and other plastics involves heating the surface to be embossed to a temperature of from 700 to 1000° F., but only over the exact area to be embossed and exactly to the depth of the embossing. The depth can be as much as 50% of the thickness of the material. Thus, in ½-in. stock, embossing can be carried to a depth of ¼ in. without causing marring, oatmealing, or warping of the opposite surface. In fact, the protective paper coating on the opposite side of the material does not even have to be removed. As many as 240 impressions in an 8-hr. shift have been produced from a single die, and surfaces as large as a door have been embossed.

In this process, patented by Alfred A. Flaster, New York, N. Y., a single die can be repeated on large sheets. The inexpensive dies may be made of brass, plastic, or wood. It is claimed that brass dies will stand up for thousands of impressions and wood for hundreds.

Embossings show that the material does not lose its original brilliance or sacrifice fine detail even in a complex lace design or in such things as lettering and delicate intaglio sculptured relief. The process is recommended particularly for obtaining a decorative effect on material intended for table tops, walls in restaurants, signs, and so forth.



Controlled heat process permits embossing up to half the depth of material without marring, oat-mealing, or warping

Original brilliance of material is not lost by embossing, nor does new method sacrifice fine detail of even complex designs

All photos courtesy Firestone Plastics Co.

Recently installed in Radio City Music Hall is world's largest motion picture screen, which is made of a specially formulated 12-gage vinyl and measures 36 by 60 feet

Vinyl Movie Screens

AN all-plastic movie screen has recently been placed in production and is being distributed to theaters by Radio Corp. of America. The screen, known as the RCA Snowhite Vinyl Screen, gives a brighter, more uniform image than the conventional glass-beaded screen and is far more economical. It is also lighter in weight, and can be washed and cleaned.

The screens are made of a specially formulated white 12-gage Velon produced to RCA specifications by Firestone Plastics Co., Pottstown, Pa. The formulation contains an unusually high concentration of titanium pigment to give the screen a bright white surface.

The vinyl material is embossed to insure brilliant reflection of the incident light. The pique pattern of embossing was found to be ideal for the purpose.

In order to transmit the sound to the audience from equipment located behind the screen, the vinyl must be perforated. The screen contains 32 holes per sq. in., and each hole is 0.059 in. in diameter. Beckley Perforating Co., Garwood, N. J., handles the perforating.

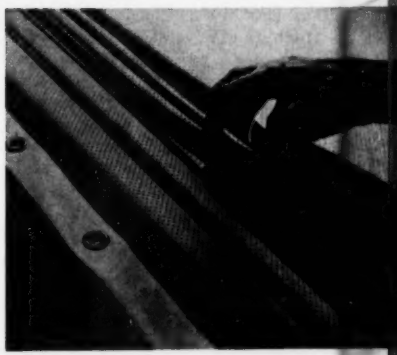
The screens are fabricated from 54-in. wide strips of vinyl, and all seams are sewn because the high concentration of titanium in the material makes heat sealing difficult.

When the screen is hung, it is laced to the steel screen frame and pulled tight to eliminate sags and wrinkles.

One vinyl screen, recently installed in the Radio City Music Hall, is 36 by 60 feet. Unlike the glass beaded screen it replaced, which had to be shipped on a mandrel, the Velon screen was shipped in a crate 8 ft. by 3 ft. by 6 inches.

During installation at Radio City, one side of screen is laced to steel frame

Seams are sewn in strips on machines designed for handling long lengths



Vinyl screen has 32 perforations per square inch for sound transmission

Crease resistance of vinyl permits screen to be shipped in relatively small crate instead of on a mandrel

Potting with Plastics

Successful potting of electrical and mechanical components calls for versatile materials. Plastics fill the bill

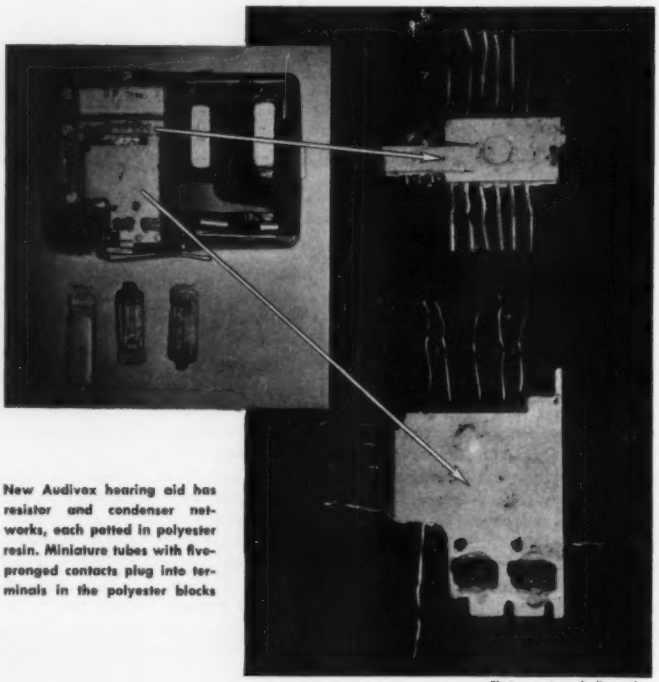
by JOHN DELMONTE

OF immediate importance to many military and civilian applications is the use of various plastics materials as potting compounds. By encasing instrument or other components in a solid mass of plastic, a number of advantages may be realized which are of particular interest in mechanical and electrical uses. Not only does the potting plastic hold components rigidly in position, but it also provides a number of other desirable benefits, which include the following:

Maximum Resistance to Water and Water Vapor—When components are fully embedded in plastic, the effect of moisture is held to a minimum by the impervious barrier of the potting compound. In fact, this treatment gives the equivalent of a hermetically sealed unit. However, the ruggedness of a potted unit gives added advantages.

Resistance to Dislocation Due to Shock—Under severe mechanical shock, such as that accompanying rapid deceleration, various components may tend to shift position. This tendency is minimized when the components are held firmly by a potting compound. An outstanding example of this benefit is the protection offered to electronic gear and recording apparatus expelled from V-2 rockets after test firing.

Improvement in Heat Dissipation—Many electrical or electronic devices give off heat during operation. If this heat is allowed to accumulate in a dead air space, the temperature may rise to an undesirable degree. However, if potting is employed, the heat may be dissipated through the plastic, resulting in improved and more uniform performance. By the same token, the cooling effect of low temperatures can be minimized if a potting material is selected because of its very low thermal conductivity properties.



New Audivox hearing aid has resistor and condenser networks, each potted in polyester resin. Miniature tubes with five-pronged contacts plug into terminals in the polyester blocks

Photo courtesy Audivox, Inc.

Leakage of Electric Currents Minimized—Most insulating materials experience changes in their dielectric behavior when exposed to variations in atmospheric conditions. Surface insulation resistance will decrease and power factor will increase when moisture content becomes greater or mold and fungi growths become rampant. The ubiquitous potting compounds are of decided benefit when employed in these circumstances.

Resistance to Chemical Fumes—There is no better protection of stationary parts against damage from fumes and corrosive atmospheres than complete embedding in a chemically resistive material. Adequately applied protective coatings may in some cases represent a more economical choice, but if heat dissipation and other qualities must also be considered, then a potting compound may be the more logical choice.

Choice of Materials

The many qualities required in different applications of potting compounds will not be found in any one material. Instead, a number of materials should be considered with

a view to obtaining the qualities most desired. In the organic plastics, there are soft materials possessing rubber-like qualities, such as the silicones; materials with outstanding dielectric properties such as the dichlorostyrene casting compounds; and materials with good heat resistance such as mineral-filled furane casting compounds.

Physical Qualities

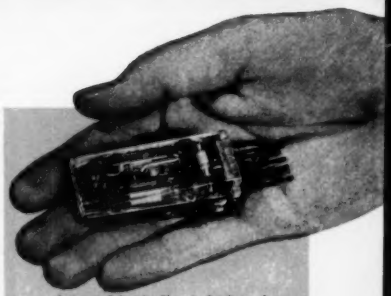
Some of the properties of available potting compounds have just been described. There are also other significant physical qualities which these materials should have for specific applications. These qualities may be summarized as follows:

Ability to Flow and Embed Components—It is expected that potting compounds will be capable of flowing (without benefit of volatile constituents) to completely fill all voids, and displace all air pockets.

Simultaneous application of heat and pressure as in transfer or injection molding will permit transformers and motor armatures, for example, when positioned in a mold, to be completely embedded in a moldable plastic. Thermosetting phenolic and melamine formaldehyde plastics have been acceptable in these tasks.

Perhaps the oldest technique of potting is found in the methods of melting a compound and pouring into a mold, where the material encases the assembled components and cools in place. Hot melt waxes, asphalts, and natural resins are legion in this respect, though they have their own innate difficulties such as cavitation while cooling and low mechanical strength. Hot melts of the rubber-like plastics compounds such as plasticized polyvinyl, cellulose acetate butyrate, and ethyl cellulose would qualify very readily as acceptable hot-melt compositions.

Plastics potting compounds which are fluid at room temperature have attracted the interest of the Armed Forces. Partial polymers of phenolics, furanes, polyesters, modified styrenes, and thermoplastic monomers offer a very large selection from which to choose. Also to be included in this classification are polyvinyl plastisols which, though fluid at room temperature, are gelled by heating. Table I gives a qualitative comparison of some of the characteristics of these materials. There are different degrees of fluidity, of course, and some—like the NBS potting compound described below—will require air pressure or a vacuum technique to force the material into all interstices of assemblies being potted.



Courtesy Sylvania Electric Products, Inc.

Electronic unit for airborne telemetering system is encased in clear cold setting polyester resin. Two subminiature electron tubes and other components are mounted on a thin panel and then molded in polished split brass mold

Absence of Volatiles—Though not always readily attained, particularly in thermosetting polymers depending upon condensation-polymerization processes, complete absence of

Table I—100% Plastics Materials as Potting Compounds

Name of material	*Physical state at room temperature*	*How prepared for potting*	*Characteristics developed when set*
Phenol-formaldehyde resins	High viscosity liquids	Activated with acid catalysts	Rigid castings
Furane resins	Low-moderate viscosity liquids	Activated with acid catalysts	Rigid castings
Polyesters	Moderate-high viscosity liquids	Activated with peroxide catalysts	Rigid to semi-rigid castings, depending upon modification with thermoplastic monomers
Silicones	Moderate-high viscosity liquids and pastes	Cure at high temperatures	Heat-resistant rubber-like materials of various consistencies
Styrene monomer, dichlorostyrene monomer, and polymer additions	Low-moderate viscosity liquids	Activated with peroxide catalysts and heat	Various degrees of thermoplasticity, depending on cross-linking agents added
Methyl methacrylate monomer	Low viscosity liquid	Activated with peroxide catalysts and heat	Rigid, clear thermoplastic castings—may be modified with polymer
Styrene monomer	Low viscosity liquid	Activated by high temperature and peroxide catalysts	Rigid, clear thermoplastic castings
Ethoxylines	Solid crumbs and liquid hardener	Melted at higher temperatures. Cure with heat	Low shrinkage, good adhesion
Cellulose ester and cellulose ether. Hot melt compositions	Semi-rigid lumps	Melted at high temperature	Rubber-like solids
Polyvinyl chloride hot melts	Semi-rigid lumps	Melted at high temperature	Rubber-like solids
Polyvinyl plastisols	Liquid	Gelled by high temperature	Rubber-like solids of various degrees of firmness

Table II—Composition of NBS Casting Resin

Material	*Percent by weight*	*Function*
2,5 dichlorostyrene	33.0	High polymerization rate
Styrene	21.0	Reduce viscosity of mixture
Hydrogenated terphenyl	13.0	Reduce brittleness
40% divinyl benzene solution	0.5	Cross-linking agent
Poly-2,5 dichlorostyrene	21.5	Reduce shrinkage
Polystyrene	11.0	Reduce shrinkage

volatiles is desirable for optimum effectiveness as a potting compound. Notwithstanding, many electrical manufacturers have developed production schedules involving multiple dips and baking periods using low cost varnishes or lacquers. In this manner, coatings are built up which may be considered as equivalent to the results obtained by potting, though the likelihood of voids and entrapped air is increased. In such electrical circuits, an air space may produce a "hot spot," resulting in burned-out wiring. For these and other reasons, potting compounds should completely supplant the air in the systems they are embedding. Whether or not this ideal is reached will depend upon the physical dimensions of the regions into which the material must flow, and the viscosity of the material.

Minimum Shrinkage—Practically all plastics shrink to some extent as they change from a liquid to a solid. In potting, such shrinkage may provide added difficulties. If the final state is rigid, delicate electronic components may become broken or other elements disarranged. While in some instances flexible vinyl sleeves have alleviated this condition, compensation is usually difficult. In general, some of the rubber-like materials will be quite satisfactory, providing their temperature limitations do not pose a serious objection.

Adhesion to Container Walls—Not always a cardinal requirement, but a consideration to keep in sight, is the problem of adhesion to the container walls into which the potting compound is poured. Presumably, if the material pulls away from the walls during cooling, some of the components may be exposed to atmospheric influences. In the miniaturization of some electronic components, the frame supporting these elements may be of the same material as the potting compound; when a pour is made, the frame and compound become welded together to form an integral whole.

Selection of Material

Table I lists some of the various materials which are available as potting compounds. The most widely used of these are perhaps the polyesters and modified styrene, desirable for their good dielectric characteristics. Because some of these compounds may be new to the reader, a few comments upon the various types are presented here:

Phenolics—Casting compounds are well known and successful in tooling. The strong acid catalysts employed for rapid setting may be detrimental to the elements being potted. Poor dielectric behavior at high frequencies is experienced.

Furanes—Their low viscosity permits tolerance of large amounts of inert fillers. However, they are dependent upon acidic catalysts and subject to the same conditions which limit the use of phenolics.

Polyesters—There are many types of polyesters which yield flexible to rigid products. They may be used with or without fillers, and in the absence of volatiles afford many good characteristics for potting.

Silicones—Heat resistant, rubber-like compounds are available from the silicones. Cured at temperatures of about 300° F., the silicone potting compounds combine good electrical and heat properties.

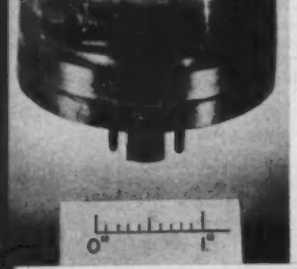
Modified Styrene—Perhaps one of the best examples of a modified styrene developed for the potting of electronic components is the NBS resin developed at the National Bureau of Standards.[1] It possesses a low dissipation factor over a wide range of frequencies and a uniform dielectric constant, making it ideally suited to many of the high-frequency systems for which it was developed. The formula for this compound is given in Table II.

By employing styrene and dichlorostyrene as the major constituents of this resin, low dissipation factors are obtained. However, this mixture is quite viscous. It must be blended on mixing rolls or in a ball mill, and must be refrigerated to store, as discussed by one company using the NBS material on a production basis.[2] Benzoyl peroxide was used

[1] "Development of NBS Casting Resin" by P. J. Franklin, D. French, and W. Nyberg, NBS Circular 493, May 22, 1950.
[2] J. Bayha, Electronics, *23*, 100, July 1950.

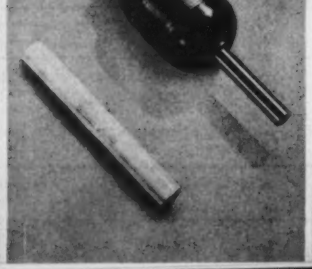
Amplifier circuit is potted in transparent N.B.S. casting resin

Courtesy National Bureau of Standards



Small armature with windings is potted in plastic by transfer molding process

Courtesy Molded Industrial Duresinoids, Inc.



Magneto coil is encased in specially developed phenolic molding material. Winding is placed in tube and insulating material injected

Courtesy Durez Plastics & Chemicals, Inc.

as the catalyst, and a cure of 12 hr. at 50° C. was practiced. It was found that potting in a polystyrene case worked out successfully.

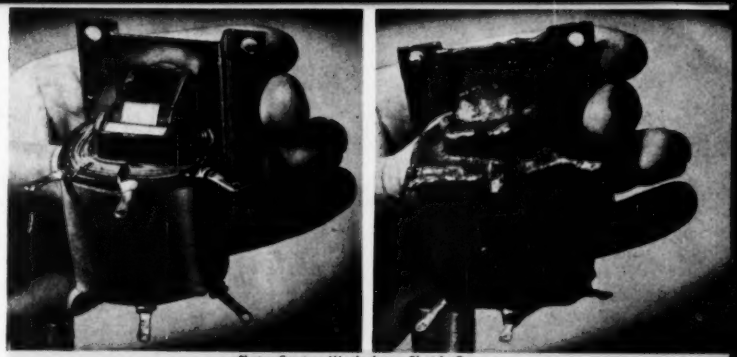
Another modified styrene compound finding use as a binder and as a potting compound is Fosterite, developed at Westinghouse Electric Co., Pittsburgh, Pa., from styrene and an acid half ester of castor oil and maleic anhydride.[3] Significant use has been made of this compound in potting transformers.[4]

Methyl Methacrylate Monomer—The successful embedment of botanical specimens in transparent methyl methacrylate attests to the good possibilities of this resin as a potting compound. However, large shrinkage, critical curing temperatures, and high exotherm have thus far kept this material from extensive applications in potting.

Styrene Monomer—Objects have been embedded in polystyrene castings for a number of years. The long polymerization cycle (2 or 3 days) at a high temperature has, however, precluded this material from wide use in potting. There have been ingenious developments using styrene for potting capacitors. The plates, separated by thin foils of polystyrene, have been united into a composite whole through the use of monomer as a potting compound.

Waxes—Nitro waxes, paraffin wax, chlorinated waxes, carnauba wax, montan wax, micro crystalline waxes, etc., have been considered for potting purposes. By extending their melting points with cellulosic derivatives and synthetic resins it may be possible to enhance the interest in these materials.

[3] V. Swiss, N. Foster, U. S. P. 2,439,953 to Westinghouse Electric Co., April 20, 1948.
[4] N Foster, U. S. P. 2,484,215 to Westinghouse Electric Co., Oct. 11, 1949.



Photos Courtesy Westinghouse Electric Corp.

Radio transformer (shown at left before treatment) is impregnated with liquid resin which is retained by baked resin casing. Finished transformer (right) is completely protected from moisture

Hot Melts—Hot melts of polyvinyl chloride and cellulosic derivatives may be considered for potting purposes. Possessing rubber-like qualities when cured, they display many characteristics often sought after in potting. However, they are quite viscous and would require the use of air pressure or vacuum during the potting procedure.

Polyvinyl Plastisols—Fluid and capable of being poured at room temperature, polyvinyl plastisols may be gelled by heat to a rubber-like mass. These are desirable attributes in numerous electrical circuits which may require potting. The moderate viscosity at room temperature permits easy penetration into small interstices.

Ethoxylines—The ethoxylines, recent additions to the family of synthetic resins, have exhibited promising qualities as casting and potting compounds. The resin, furnished in the form of yellow-brown crumbs, begins to melt at 120 to 140° F. and flows freely at 260 to 270° F. On the addition of a liquid hardener, it can be cast readily into suitable containers. No volatiles are given off and no exothermic reaction occurs. In consequence, the shrinkage is small, a quality of decided advantage in potting.

Applications

The potential applications of potting compounds are innumerable, opening up relatively unexplored fields for the liquid plastic materials. High on any list would be applications in the electrical and electronic fields, where potting compounds were first introduced, ostensibly in lieu of hermetical sealing, but with desirable heat dissipation as well as mechanical advantages.

Hearing Aids—Newly developed hearing aids employ condenser and resistor network assemblies embedded in a polyester resin. With this material the effects of humidity and dust are minimized, and parts are protected from shock. The reduced

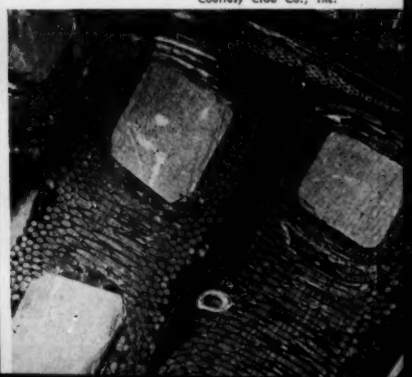
(*Continued on* p. 159)

Single block of polyester resin contains the entire electrical assembly for aerial cable terminal. The plastic block makes a gas-tight joint with the cable sheath and the conductors

Courtesy Bell Telephone Laboratories

Enlarged cut-away section of filter coils potted in ethoxyline shows penetration of resin

Courtesy Ciba Co., Inc.



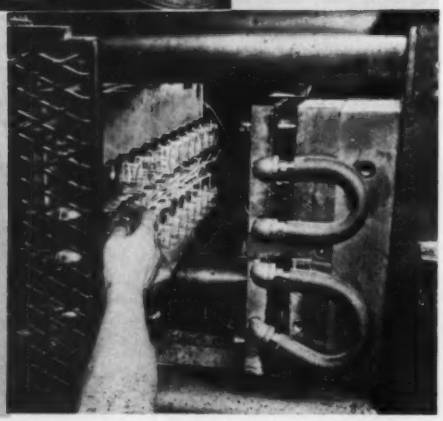
Styrene Cores for Scotch Tape

Self-shearing 20-cavity molds speed production; cores are less expensive; consumer gets full measure of usable tape per roll

Specially formulated granulated styrene being poured into hopper of 9-oz. molding machine used to manufacture cores for small-size rolls of cellophane Scotch tape

All photos courtesy Minnesota Mining & Mfg. Co.

Over-all view of molding machine turning out ¾-in. width styrene cores. Before cores are placed in bin, they are inspected on the conveyor belt



Close-up of mold before 20 styrene cores are ejected from cavities. Hand is touching self-sheared runners and sprues. These are later ground and re-used

STYRENE cores for rolls of tape, made by the use of injection molding, pin-point gating, and self-shearing molds, are now being produced by Minnesota Mining & Mfg. Co., St. Paul, Minn. Made of transparent styrene, the new cores—hollow cylinders with an unusual geometrical ribbing pattern—have taken the place of laminated paper cores on the smaller-size rolls of transparent Scotch brand cellophane tape. Not only are these new cores more economical to produce, but they offer advantages of economy to the ultimate consumer — they prevent tape wastage at the inner end of the roll.

Within the past few months, the new plastic cores have been used exclusively in the production of 15, 25, and 39¢ rolls, 3M company officials point out.

Self-Shearing Molds

One of the few, high-volume plastic molding jobs being done with self-shearing molds today, the new cores are produced at a rate of 5000 to 6000 per hour by the 3M firm and Minnesota Plastics Corp., St. Paul, Minn.

Each mold has 20 cavities which produce 20 completely trimmed, ready-to-use cores during each cycle. Reverse engraved plates in each cavity reproduce the Scotch trademark and other related information on the cores during the molding operation.

The completed core-shells have an outer circumference of 4½ in., and are made in both ½- and ¾-in. widths. The over-all thickness of the molded styrene is approximately 1/32-inch.

Using 9-oz. H.P.M. molding machines, 3M's engineers worked jointly with engineers from Minnesota Plastics, and Federal Tool Corp., Chicago, in the development of the self-shearing molds and of the finished machines.

During the molding operation the

styrene is injected through pin-point gates. After injection, the mold is opened and the 20 ejected cores fall onto a conveyor belt, which carries them past the machine's operator for inspection while the next molding cycle is in progress.

In one molding machine set-up, the sprues and runners—automatically cut off by the mold's self-shearing action—are removed by hand from the machine and placed in waste bins for later grinding and re-use. In another set-up the same conveyor belt which carries the cores to a storage bin is also loaded with the sprues and runners for conveyance to a Cumberland grinder for grinding and later re-use.

Because of the design of the molds and of the pin-point gates, the trimmed cores require no further finishing before they are sent to the automatic machinery which winds the tape in place.

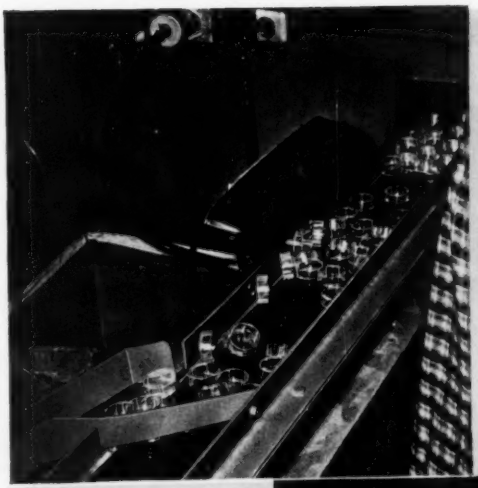
Since the project was first started, a close working arrangement with manufacturers of styrene—Dow, Monsanto, Bakelite, Koppers—has existed, 3M engineers explain. The styrene suppliers even formulated special styrene for improving the cores, they add.

The cores themselves were developed by the Production Methods Engineering Div. of the 3M firm, and were designed to fulfill a twofold purpose: 1) To improve the appearance of the tape on the roll by placing the transparent cellophane tape over a transparent core; 2) To utilize more stable and less expensive material than paper for making the cores.

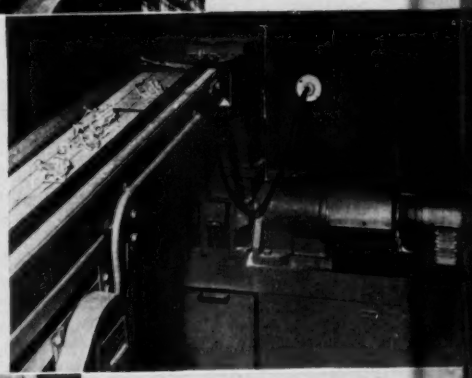
Consumer Advantage

In addition, the Production Methods Engineering group found that the new cores permit every inch of the wound tape to be used. Formerly, up to 4½ in. of every roll was wasted because it laminated itself to the paper core and could not be removed satisfactorily.

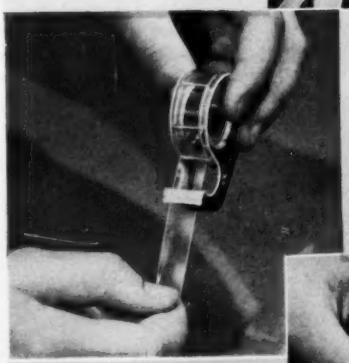
Also, it was found that the plastic cores aided production. They require less storage space in stock bins; they fit existing manufacturing equipment perfectly without being dimensionally unreliable; they permit the tape to be wound evenly without gapping or over-lap; and they eliminate the presence of "core dust," thus providing for quality rolls of tape with greater "purity."



Conveyor belt, loading from molding machine, carries completed styrene cores to the bin chute at lower left. Waste is carried further to grinder

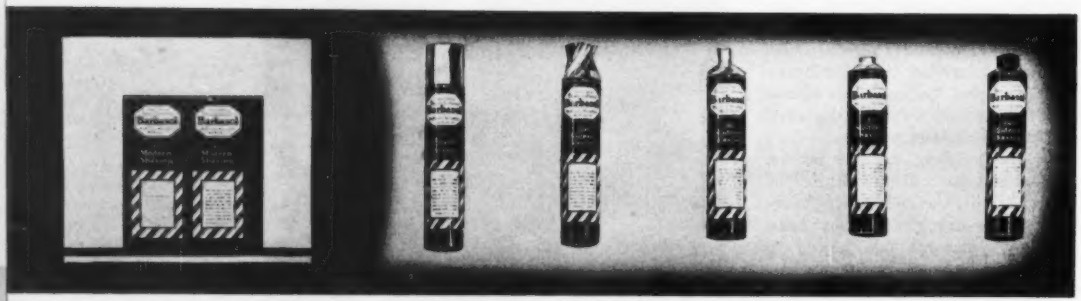


When waste material reaches the end of the conveyor belt, it drops into grinder at right, and is ground for later re-use



In use, no tape is wasted, since the styrene core permits the Scotch tape to be used to the last inch. Transparent core also improves the appearance of the dispenser

Left to right: utility dispenser, new transparent styrene core; and complete unit with tape in place



Production of a plastic-foil tube: At left is the pre-coated, pre-printed foil; sheet is first formed into a cylinder; then top is twisted to produce neck which is threaded for closure. At the right is completed, capped tube ready for filling with shaving cream

Plastics-Foil Collapsible Tubes

IN THESE days of materials shortages, packagers are showing increasing interest in a new type of convolutely wound collapsible tube made of metal foil sandwiched between two layers of plastic film. This new type of tube, developed and produced by Collapsible Tube Div., ATF., Inc., Elizabeth, N.J., has already been adopted for Benex, Ingram, and Barbasol shaving creams.

The three-ply material of which the tubes are made has the printing applied to the inner side of the outer ply of plastic film. The rolls of printed and laminated material are fed into an automatic machine which cuts the web into blanks, winds the blanks into cylindrical form, seals double layers of the wound material together with heat and pressure, and then forms the shoulder and neck of the tube by twisting and compressing one end. The bottom closure is done by the conventional method of crimping after filling.

Collapsible tube has a plastic lining which keeps icing fresh for instant use

Tubes Tailored to Needs

A number of different metal foils and thermoplastic films can be used in the three-ply material from which the tubes are formed. Among the films suitable are vinyl, polyethylene, Pliofilm, saran, neoprene rubber, and coated cellophane. Thus the tubes can be tailored to meet a wide range of product requirements; they can even be used to package foods, pharmaceuticals, and cosmetics which could not be packaged in conventional collapsible tubes because of the products' incompatability with conventional tube materials. The new tubes are thus of importance to the food industry and are being considered for catsup, mayonnaise, soft cheese spreads, fish pastes, and similar products.

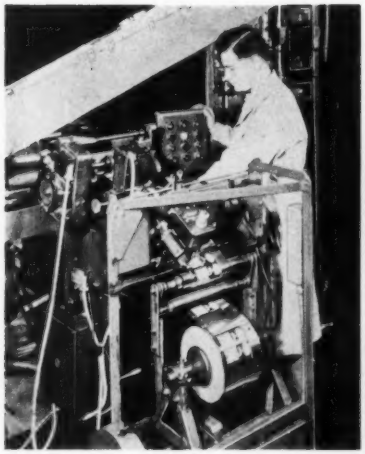
The choice of film for the inner ply, which is there to protect the product, depends upon the characteristics of the product. Polyethylene, for example, would be used for corrosive products. The choice of material for the outer ply depends upon appearance and protection. The degree of the film's transparency is important inasmuch as the printing is on the reverse side. The degree of protection necessary depends upon where and how the tube will be used —for example, whether the user's hands will be greasy or wet. The combination of films is limited only by the fact that the two films must be heat-sealable.

In addition to widening the range of possible applications, the new tubes make possible a wider range of sizes. The convolutely wound tubes can be made in lengths and diameters far beyond the mechanical limits of extrusion or drawing. Present equipment can produce tubes as small as ⅞ in. in diameter and 4⅜₁₆ in. long and as large as 1½ in. in diameter and 7¹⁵⁄₁₆ in. long. However, it is possible to make the tubes in almost any size which would be in commercial demand.

Protected Printing

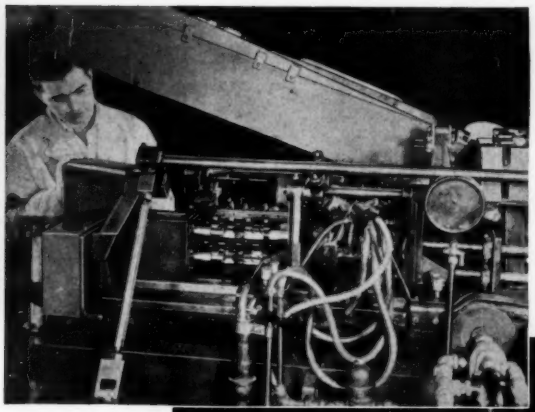
The fact that the printing is applied to the under side of the outer plastic ply protects it from handling and wear, which is often a serious problem with tubed products. Moreover, enamel decoration of extruded metal tubes cannot achieve the effects possible with multicolor gravure printing applied to the plastic film in web form. Fine printing and other effects comparable to the finest cellophane printing can be obtained on the laminated tubes.

The convolutely wound tubes can also be made stronger than is possible with thin-walled extruded tubes. The convolute winding of the three-ply material to two or three thicknesses continuously sealed from film to foil to film produces an



Left: At control point on tube-making machine, foil has been threaded through slitter—will now be cut into tube lengths

Below: Material is wound around mandrels and then is heat-sealed in heating cavity (not shown) to form tube cylinders



integral wall free of weak points and impervious to flaking, cracking, or pinholing.

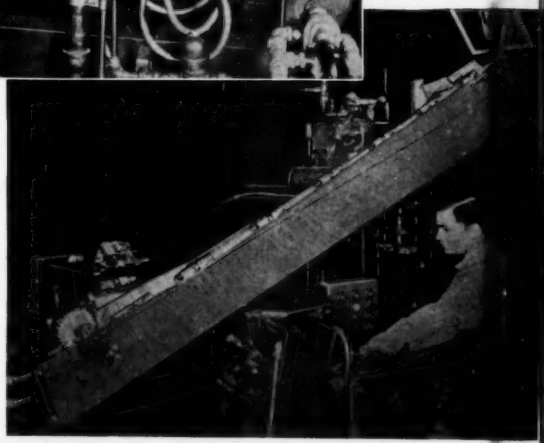
Production Details

The film which forms the outer surface of the tube is printed on modern, high-speed rotogravure presses. The film is then laminated to the foil using nitrocellulose, rubber, or vinyl resin bonding agents, depending upon the thermoplastic film used. Printing and lamination for Barbasol, Ingram, and Benex tubes are done by Shellmar Products Corp., Mt. Vernon, Ohio.

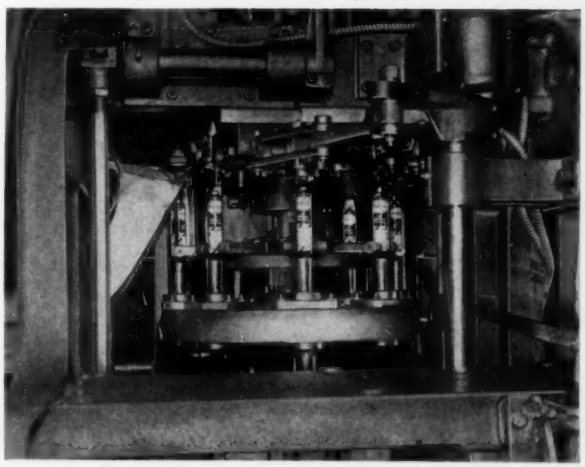
The tube production equipment is made up of two units—one to form the tube body and the other to form and finish the shoulder and neck. The web is first trimmed to predetermined dimensions and cut into tube blanks by a cut-off knife controlled by an electric eye.

The body blanks are then loosely wrapped around mandrels, with the blank lapping the mandrel slightly more than two times so that the wall of the completed tube is a double thickness of the lamination. The blank is then heat-sealed by blowing a hot air jet into the center of it while it is held in a cylindrical cavity. This expands the tube body against the wall of the cavity and at the same time heats the film to sealing temperature.

After the sealing, the tube is positioned on an upright mandrel where the shoulder and neck are formed by a series of knurling rollers and split dies.



Right: Formed cylinders are picked up by jaws at left, lifted to a conveyor, and carried on an inclined belt to top. Compressed air knocks them off so that they fall into position on mandrels of multi-station finishing turret (below)



Tubes on mandrels of finishing turret are carried through pleating and roll-down stations. Final operation is to form threads and finish the neck and shoulders

Above: Modern styling of new humidifier with styrene parts enables the appliance to blend well with home or office interior decor. Right: Old and new compared, showing advanced design of rust-proof styrene unit

Modernizing A Humidifier

Weight of unit is reduced more than 50% by switch from metal to styrene, assembly operations are simplified, selling cost is drastically slashed

FROM time to time, through unusually effective cooperation by the manufacturer, designer, and molder, a product is developed which blazes new trails for plastics because it dramatically points the way to new fields of application or demonstrates unexplored possibilities in the functional use of plastics materials.

Such a product is the new Fresh'nd-Aire electric room humidifier recently introduced by Fresh'nd-Aire Co., a division of Cory Corp., Chicago, Ill. This new type appliance, designed specifically for plastic molding, supplants an earlier model in metal, with important savings in weight and production cost and a number of interesting operating advantages.

All major parts of the new unit, with the exception of the electric motor, fan, and water pump blades and a stainless steel water tube, are molded of Dow Styron. The filter unit, which is removable for occasional cleaning and replacement, consists of shredded aspen wood held between two bands of metal hardware cloth.

The function of this appliance is to moisturize, filter, and deodorize the air in homes, apartments, offices, etc. The new humidifier is so designed and constructed that stale, dry, or smoky air is drawn into the appliance, passed through a constant "waterfall" which is moving down through the filter, and sent back into the room after being cleaned and given the proper moisture content.

Design for Plastics

The new Fresh'nd-Aire humidifier was designed "from the ground up" to take advantage of the properties of molded plastics. Charles E. Jones & Associates, Inc., Chicago, handled the basic styling of the unit, while engineering was under the direction of Lewis W. Seil of Fresh'nd-Aire. These men worked in close cooperation with the Plastics Div., General American Transportation Corp., Chicago, Ill., which made the tools and molds the styrene parts.

Officials of Fresh'nd-Aire frankly state that only molded plastic could give them the combination of features found in the new unit. Its empty weight, for example, is but 6¾ lb., compared to 15 lb. for the slightly larger all-metal model.

The use of styrene throughout permanently eliminates such problems as anodic action, corrosion and rusting, while the inherent color of the material makes supplementary finishing unnecessary. In the earlier metal unit, it was necessary to metallize the interior of the tank and also paint the outside surfaces of the appliance. Molded plastic also permitted the use of modern, contoured styling and simplified construction which makes the new humidifier easier to assemble. Such production economies enabled the manufacturer to offer the plastic humidifier at $39.95, as against $59.50 for its metal predecessor.

Ideal Material

Styrene further proved to be an ideal material for this application because of its water resistance, light weight, dimensional stability, high immunity to chemical attack, and economy.

In use, the humidifier is first filled

with up to 5 qts. of water through the side opening, which is covered by a hinged fill lid. When the motor is switched on, the fan draws air in through the cowl ring louvers, through the filter, and forces it out the exhaust grille at the top. Simultaneously, the pump circulates water at a rate of 15 gal. per hour. Normally, one filling of water is sufficient for up to 8 hr. of operation.

The principal molded part used in the humidifier is the reservoir. This piece, weighing about 20 oz., measures approximately 12 in. in diameter and 7 in. high, with a wall section of ⅛ inch. Center-gated at the bottom, the reservoir is molded with eight integral "feet." The lower portion of the water pump housing is molded directly into the bottom of the reservoir, opening into a short channel which conducts water to the feed pipe. The top of this channel is sealed by a molded cover. Four cored bosses around the edge of the reservoir provide for assembly to other plastic parts by means of thread-cutting screws.

Resting atop the reservoir is the motor base plate. The outer edge of this plate has a deep lip which fits tightly down over the reservoir.

Motor Support Strengthened

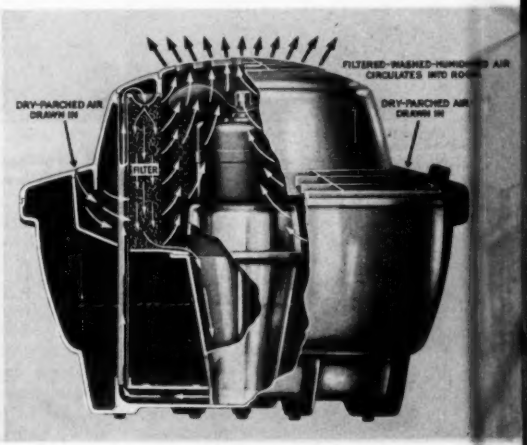
Beneath the motor base plate is the funnel-like water return, which returns circulating water quietly to the reservoir. This component has a small chamber at its lower end which forms the top of the pump housing. Extending from the motor base plate to the bottom of the reservoir, it also contributes further strength to the motor support. Three slots near the lower end of the water return cone permit water to be drawn into the pump from the reservoir.

One of the most intricate molded parts of the humidifier is the cowl ring, which is slightly more than 12 in. in diameter and 3½ in. high. In addition to carrying the graceful louvers of the intake grill around its outer edge, this piece also serves as a base for the upper (exhaust) grille and is designed with openings for the water fill lid and motor switch plate. Another function of the ring is to prevent any "splash over" at the point where water is pumped into the top of the filter. Four self-tapping screws around the edge of the cowl ring pass down through holes in the motor base plate and anchor in the reservoir casting, locking these three components into a sturdy assembly.

The circular upper grille is cemented into the top ring, which in turn is fastened to the top of the cowl ring with self-tapping screws. This is the only instance of a cemented plastic assembly in the entire unit. On its under side, the mounting ring is grooved to accept the filter ring.

The symbolic "F" molded in relief in the center of the top grille is painted in gold. Identity of the manufacturer, motor rating, and other information are molded-in directly on the under side of the reservoir, eliminating the need for a separate name plate. Name of the appliance and its manufacturer are also molded-in on the motor switch plate. The notation, "Capacity 5 Quarts" is molded-in on the inside of the water fill lid.

All plastic parts of the new Fresh'nd-Aire humidifier are produced in single-cavity molds with the exception of the motor switch plate, lid, and water channel cover, which are combined in a family mold.



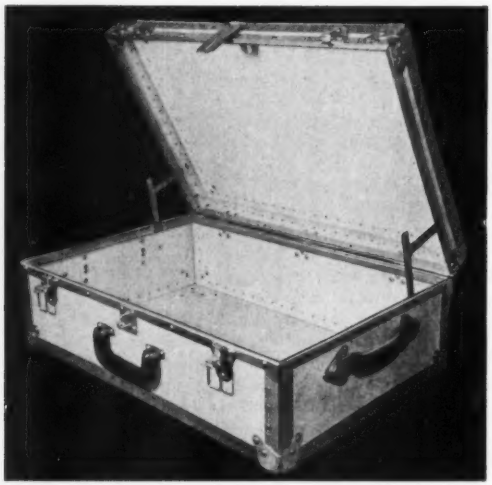
Cross-section drawing of styrene humidifier shows how appliance works. While pump circulates water, the fan draws in dry air, then forces it out, after cooling, through exhaust grille at the top

Styrene parts of humidifier include: reservoir (upper left) which serves as base; motor base plate (upper right); louvered cowl ring (lower left); and top grille (center)

Fabricated

All photos this page courtesy M. R. F. Canada Co.

Kit boxes fabricated of polyester glass fiber sheet for military personnel have stood up well under the abuse of combat in Korea

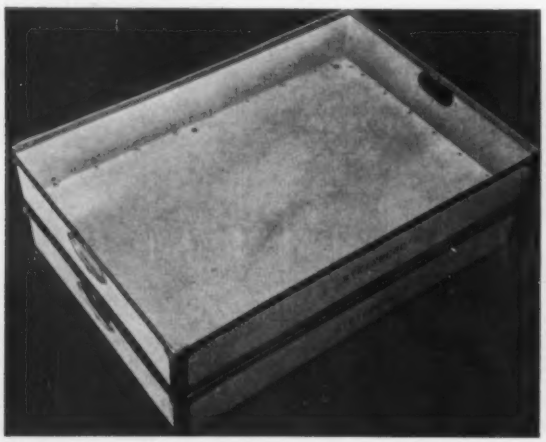


Heavy-duty suit case showing how sheets of flat, reinforced plastics are assembled to other parts through use of metal rivets

A NEW approach to the manufacture of super-strength tote boxes, industrial trays, portable lockers, and military luggage is evidenced in the work being done by M. R. F. Canada Co., Montreal, Canada, and Fibre Products Mfg. Co., New York, N. Y. Both of these companies are using polyester Fiberglas sheet produced by Molded Resin Fiber Co., Ashtabula, Ohio, combining the fabricated sheet reinforced plastics with channel and angle sections of stainless and cadmium plated steel and aluminum in the fabrication of exceptionally strong carrying units which will take a lot of punishment. Chrome-plated or stainless steel rivets are used.

The completed products—whether for use by the Armed Forces, by super-market chains, by fruit packers, or by others—are declared to be practically indestructible. They are not subject to rust, rot, or corrosion, are mold-proof, and can be made water-proof. They may be steam-sterilized, are unaffected by heat or cold, and have all of the tensile and impact values possessed by reinforced plastics.

The first project of this type was a box fabricated by M.R.F. to the



Left: Bread and cake tote boxes of the non-folding type can be stacked conveniently to conserve space. Below: Sturdy grocery and vegetable tote boxes are built to take plenty of punishment

Reinforced-Plastic Boxes

specifications of the directorate of Inter-Service Development under the Canadian military procurement program. The box previously used was made of ¼-in. plywood and weighed 25½ lb.; the plastic-glass-metal box weighs 16 lb., and it has been found possible to reduce the weight of the metal components to obtain a greater strength-weight ratio. This box has been subjected to substantial testing and has stood up well. While no government orders have been placed, a great number of the boxes have been supplied to the Canadian officers in Korea for officers' use.

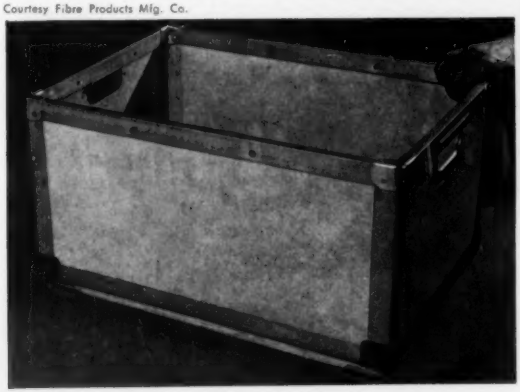
The second step came in the use of the same technique for the manufacture of a folding bread or cake tote box, made by the same company for several accounts including Steinberg's Service Stores in Montreal. This box weighs only 3 lb. 2 oz. as compared with the 5 lb. 2 oz. weight of standard wooden folding boxes. The plastic box is hinged at all corners and folds flat for empty shipment to point of filling. It takes in stride the most violent treatment ever accorded to this type of product and is receiving a great deal of attention from other possible users.

Naturally, one of the chief reasons for the initial development of these new boxes in Canada is the fact that the Canadian market cannot absorb the quantities of boxes that could be most economically made by the molding technique; fabrication is the most economical method of producing runs of 500 or less.

A new box made by the same general method is announced by Fibre Products Mfg. Co. to replace less efficient boxes fabricated from fiberboard. Chief factor in the development is the moisture-resistance of the plastic unit. In this case, the polyester glass box is about the same weight as the fiber box, but is about 30% more expensive. However, its life, as predicted by accelerated tests, should be a great deal longer. It is fungus resistant, readily cleanable, absolutely moisture-proof, and easy to maintain.

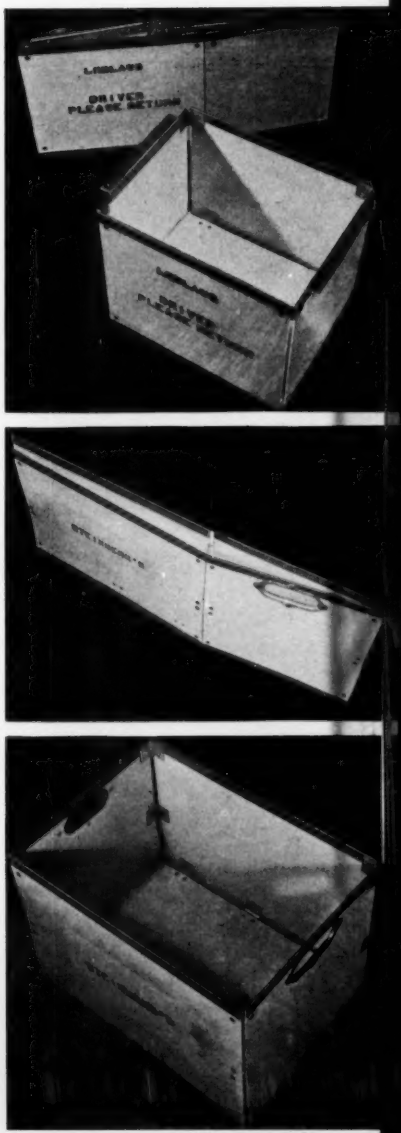
There appears to be literally no limit to future markets for materials fabricated in this manner. Experimental luggage made from it is standing up very well, and reports from the Canadian forces in Korea indicate that it can stand up under combat service.

The sheets generally used are 0.070 in. thick and 28 by 37 in. in size, with 30½ by 48 in. sheets now available. Sheets are cut with carbide tipped tools or sheared with a regular flat-metal shear. Holes can be drilled or punched. Tightness of joint is assured only by riveting, but gaskets could be used if it were deemed necessary.



Polyester glass fiber sheets replace fiberboard in sides and bottom of this tote box, which is provided with wooden bottom runners to facilitate handling

Courtesy Fibre Products Mfg. Co.



Courtesy M. R. F. Canada Co.

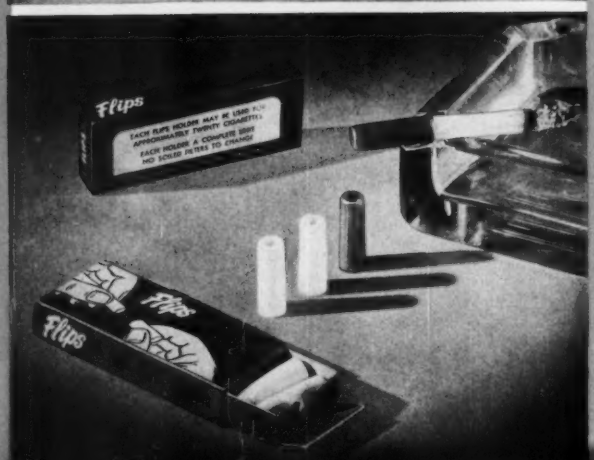
Two types of folding tote boxes fabricated from polyester glass fiber sheet. Hinges at all corners permit the bottoms to fold inside the side pieces, enabling boxes to be shipped flat to the point of filling. In the box in top picture, flanges have been provided to hold box in truck racks

PLASTICS

Compartmented tray molded of melamine cuts down on dishwashing time by eliminating plates and saucers. The tray has three compartments for food, one for silverware, and two molded-in depressions to hold a cup and a bowl. The deep cup and the 10-oz. bowl in the manufacturer's line of Arrowhead Ever Ware Melmac dishes fit into the depressions. The tray is ideal for serving snacks, sick room meals, or buffet suppers. Made in seven colors by International Molded Plastics, Inc., 4387 W. 35th St., Cleveland 9, Ohio

Girls who work and like to take their lunch to work often do not do so because they don't want to carry a lunch box or brown paper bag. The answer to their problem is the Lady Betty Lunch-N-Bag which looks like a large shoulder-type brown alligator handbag. It has room in the top for the usual contents of a small handbag—plus enough room in the large lower compartment for lunch and vacuum bottle. The bag is molded of Hercules cellulose acetate and has a vinyl strap. It is made—as is the vacuum bottle—by Landers, Frary & Clark, New Britain, Conn.

Accurate, 4-in. long replica of the 1911 Model T Ford is molded of cellulose acetate. Squeezing a button, which is connected to the car by a flexible metal cable, makes the car "buck" and throws the driver partially out of his seat. The car is black and has red wheel spokes and gold radiator, horn, and hub caps. It is made by Precision Specialties, Inc., 212 N. Western Ave., Los Angeles, Calif.

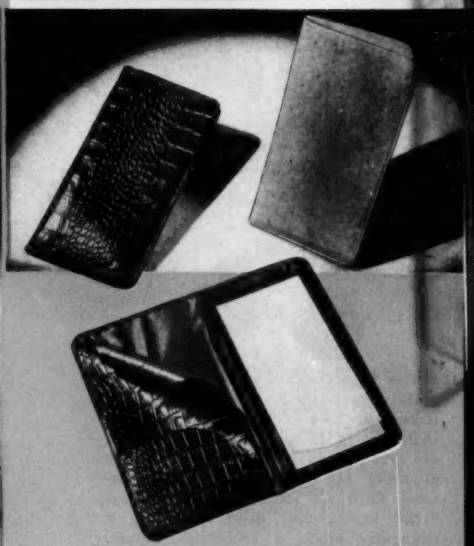


Combination cigarette holder and filter, inexpensive enough to be disposable, is molded of styrene. Each holder, containing a paper filter cartridge, is discarded after smoking 20 cigarettes. The holders are inconspicuous, particularly when molded of white styrene. They are made in white or red by Elmira Filter Tip Corp., P. O. Box 946, Elmira, N. Y.

PRODUCTS

One-piece molded polyethylene towel holder grips the corner of a towel, apron, or rag firmly, allowing it to hang in a neat, loose drape for faster drying. The towel can be put in place with only one finger, and is removed by merely pulling on it. The three gripper flaps will not break, cannot tear the material, and will always return to their proper position after the towel is removed. Made by A. J. Ganz Co., 112 N. Hayworth Ave., Hollywood, Calif.

Colorful rattles in the shape of the first four letters of the alphabet are molded of styrene in two halves; one half is transparent and the other opaque. Colored balls inside the hollow letters click as they roll around and can be watched through the transparent half of the toy. The rattles are easy to grip, can be used as teethers, and will float in the bath tub. Manufactured by Knickerbocker Plastic Co., Inc., 4101 San Fernando Rd., Glendale, Calif.



Wallet made of 20-gage vinyl embossed to resemble leather grains, is lined with 4-gage vinyl embossed to look like satin. All seams are electronically sealed, and lining is also welded in place. Made in calf, ostrich, alligator, and other finishes by Bee-Lyne, Inc., Broomall, Pa.

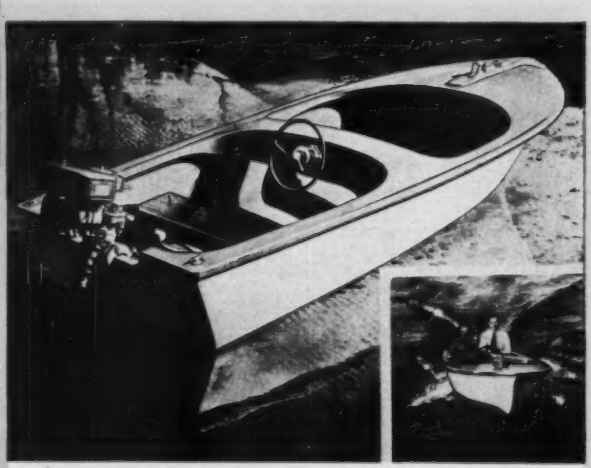
Shuffleboard disk is made of finely ground hardwood and Durez phenolic resin. The disks are long wearing; they have no grain structure, therefore will not splinter or crack. They are standard in size and weight. Made by Norman Parke Co., Chicopee Falls, Mass., for General Sporticraft Co., Ltd., 215 Fourth Ave., New York, N. Y.

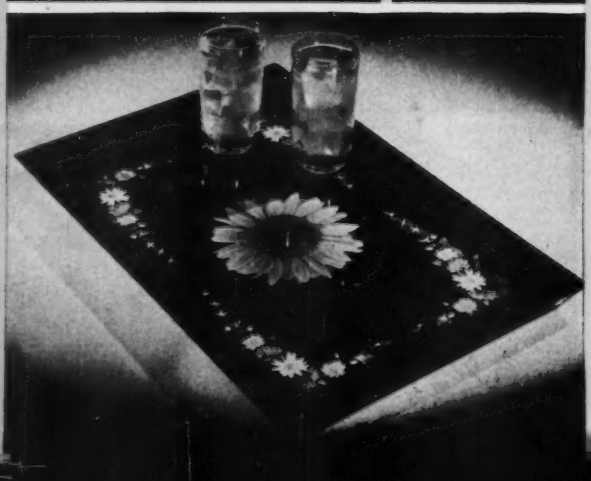
PLASTICS

Carrying wet clothes to the line in a conventional wicker laundry basket is a back-breaking job. But carrying the same load in the Damp-Champ Super is easy because this laundry bag, fabricated of 8-gage vinyl, can be slung over the shoulder. It thus leaves both hands free and eliminates repeated stooping while hanging the wash on the line. The bag holds two machine loads of clothes and can be used as a dampening bag. All seams are electronically sealed. Damp-Champ Super is manufactured by Humphrey-Callender, Inc., 618 W. Adams St., Clinton, Ill.

Hollow blocks molded of Tenite I cellulose acetate have metal snap fasteners attached to them. The dozen geometric shapes which make up a set of Snap Blocks can thus be used to build men, vehicles, or anything the child's imagination dictates. Each set consists of four cylindrical blocks, four disks, a sphere, a triangular block, a rectangular block, and a fiber-board base with snap fasteners on it. Made in assorted bright colors by International Molded Plastics, Inc., 4397 W. 35th St., Cleveland 9, Ohio

Thirteen-ft. runabouts have one-piece hulls molded of Fiberglas impregnated with Laminac polyester resin. Color is molded-in, thus eliminating the necessity for painting, scraping, or refinishing. The Ford Sportliner Deluxe 13 (shown below) has forward cockpit with back rest for the seat, after cockpit with dash for wheel and throttle controls. It has a beam of 60½ in., weighs 240 pounds. Standard Sportliner is same size but has three seats, no dash, weighs 232 pounds. Made by Ford Moulded Fibre Corp., Marine Div., 60 N. Rose St., Mt. Clemens, Mich.



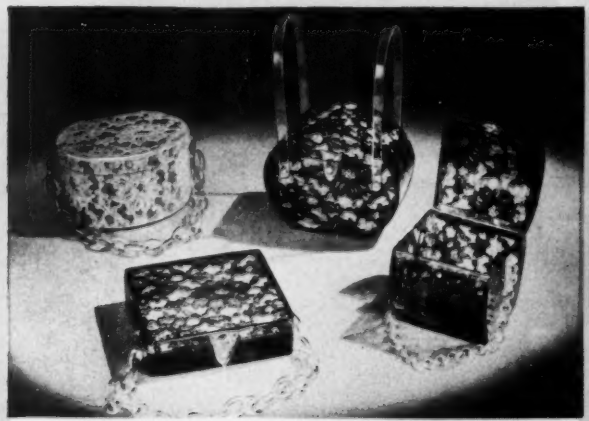


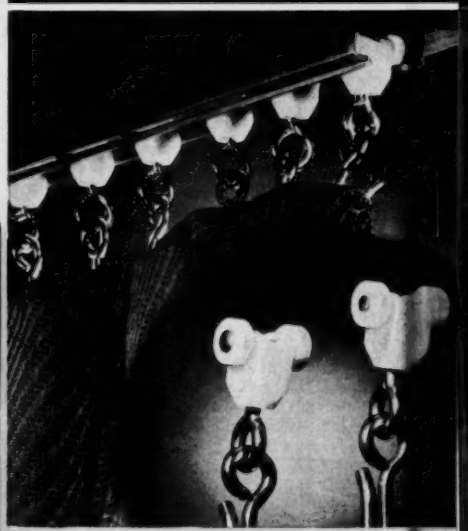
Durable, all-plastic serving tray is made of high pressure melamine decorative laminate with molded phenolic frame. The 13- by 18-in. tray is thus alcohol-proof, has no paint or lacquer to chip off, and will not warp. Made in sunflower or rose pattern with black frame by Susquehanna Mills, Inc., 404 Fourth Ave., New York

PRODUCTS

Maximum-Minimum window thermometer is housed in durable, weatherproof Tenite II cellulose acetate butyrate. The circular housing consists of gray bezel and translucent white back plate. Light coming through the back makes the numerals on the glass front stand out against the dial face. Two small pointers indicating temperature extremes since last resetting can be moved back against the main pointer by turning knurled knob in center of dial face. Bezel molded by Erie Resistor Corp., Erie, Pa., back plate by Detroit Macoid Corp., 12340 Cloverdale, Detroit, Mich. Taylor Instrument Companies, Inc., 95 Ames St., Rochester 1, N. Y., manufactures the unit

Handbags fabricated of ⅛-in. acrylic sheet and known as Westermodes, have Chantilly lace design applied to the inside surface. They are particularly suitable for evening or cocktail wear. The bags are made in seven styles: three with chain handles, three without handles, and one with rigid handles. They are all made of clear acrylic with the lace pattern in black, white, or gold. Made by Ben Westerman, Inc., 358 Fifth Ave, New York





Sliding curtain hardware, designed for use in hospitals, eliminates noise by eliminating metal-to-metal contact. Carrier bodies and rollers are molded of Tenite II cellulose acetate butyrate. They are thus shatterproof, rust-proof, and silent. The plastic parts are molded by Arnold Brilhart, Ltd., Mineola, N.Y., for Grant Pulley & Hardware Co., Broadway at 57th St., Woodside, N.Y.

Tray and double-walled jug of the Thermal Guest Set are molded of heat-resistant styrene. The jug lid can be raised by thumb pressure for pouring or snapped out entirely for easy cleaning. The 20-oz. jug will keep fluids cold or hot for many hours, and is ideal for guest rooms, sick rooms, offices, or on speaker's platforms. Made by Victory Plastics Co., 81 Apsley St., Hudson, Mass.

SPECIFY

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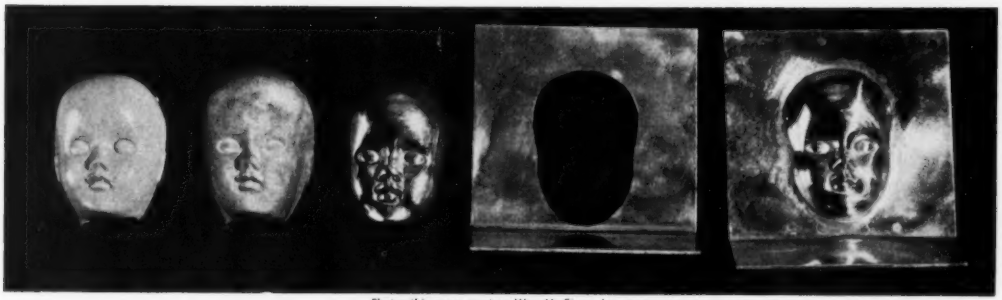


Photos this page courtesy Wm. M. Fiore, Inc.

Steps in making spray mask. Left to right: unsensitized injection molded plastic doll head; rough electroformed shell, still on plastic head, as removed from plating fixture; shell polished, ready for mounting; mounting plate with cut-out hole to fit shell; mask mounted by soldering

Electroforming for Plastics

Spray masks and specialized molds are accurately produced by electroplating a copper shell over a prepared matrix

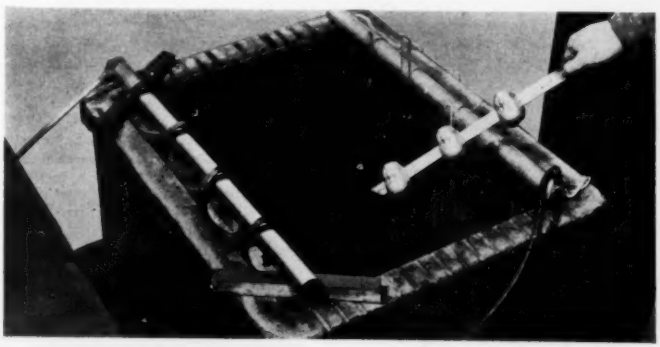
ELECTROFORMING is the term used to designate the manufacture of products by extended electroplating and is of interest to the plastics engineer because of its use in producing molds and spray masks for plastics products.

In mold making, electroforming is coming into some use in the production of molds for both injection and low pressure molding. It is especially useful for deep narrow cavities such as those needed for molding fountain pen or pencil barrels. Cavities of this type are practically impossible to hob unless they are made in two halves which are clamped together during molding. These two-piece cavities are generally unsatisfactory because of poor alignment, visible parting line, and (sometimes) flash; in addition, these molds are relatively high in cost. When made by electroforming, deep narrow cavities are inexpensively built-up in one piece on an accurate steel mandrel.

Thin shell-like molds for slush molding[1] are also being produced by electroforming. Because no pressure is used in this process, the molds need be electroformed to a thickness of only about 1/16 inch. Initial molds for slush molding jobs are generally made on a sensitized wax model or matrix, after which successive molds may be electroformed directly on the slush molded products from the original mold.

Most extensive use of electroforming in the plastics industry is for the production of spray masks or stencils which are used to protect certain areas of a plastics part while leaving the remaining surface free to be decorated with paints or lacquers which are generally applied with a spray gun.

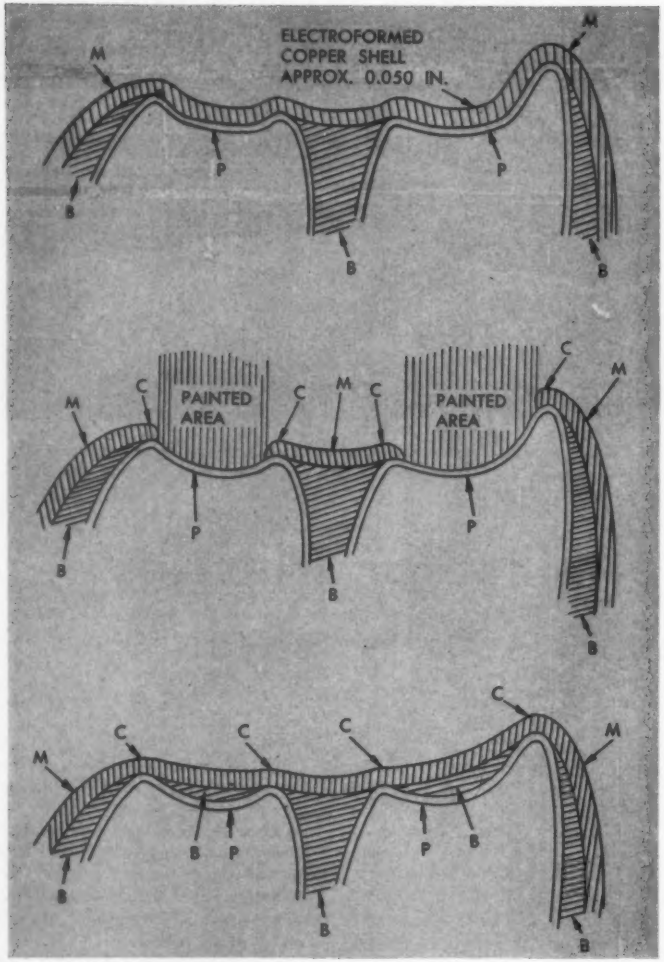
In toys, novelties, dolls, indicating



Three molded plastic doll heads, cemented to an acrylic plating fixture and made electrically conductive, are loaded into plating bath for building up painting mask

* Reg. U. S. Pat. Office

[1] MODERN PLASTICS, *28*, 101, (Oct. 1950)



Illustrations this page courtesy Wm. M. Fiore, Inc.

Sections of electroformed masks. Top—with blocking for ease of insertion only; center—with openings provided for spraying paint; and bottom—painted area protected during spraying of other detail. Key to parts: C—points of contact between mask and molded plastic part; B—blocking material; P—section of the plastic part; and M—spray mask

dials, automobile and refrigerator parts, and many other plastics products, multi-color decoration adds immensely to sales appeal and utility. Stencil spraying results in uniform decorating jobs; since stencil spraying does not require skilled artistry, it may be accomplished at greater speeds and less cost than hand painting. These advantages, however, can be realized only when properly designed and accurately fitting masks are used.

Many methods have been tried for making spray painting masks, but only electroforming has been uniformly successful. Making good masks by this process requires—in addition to a complete knowledge of the electroplating art—the entire know-how of paint spraying, a mastery of mask design for high speed work with no loss of accurate and positive fit, and a complete understanding of plastics materials and plastics molding problems.

Classes of Masks

There are two general classifications of electroformed stencils—"blocked" and "unblocked."

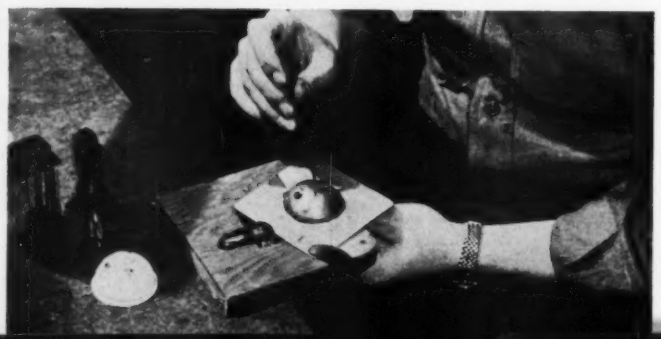
Unblocked stencils are formed by plating directly over the molded part which thus serves as a matrix. With the exception of their open sections, these stencils are in intimate contact with all other surfaces of the part being decorated.

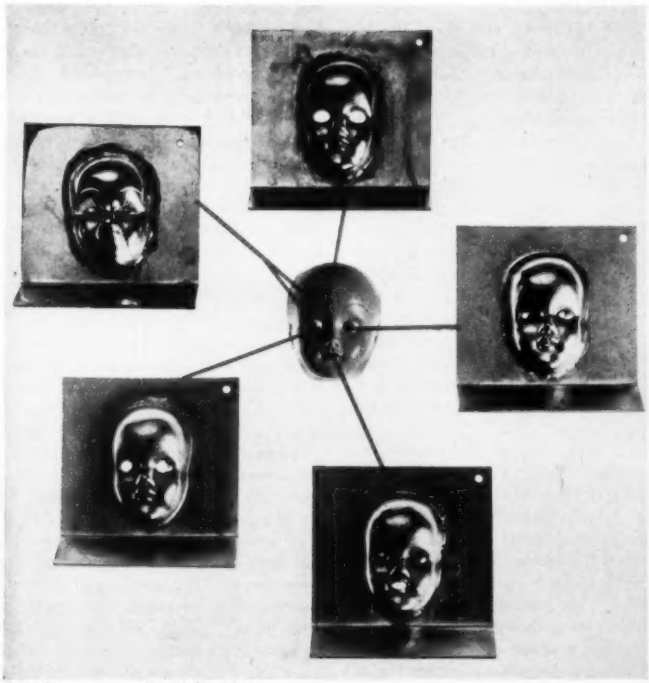
The blocked stencil is one which, by the process described below, is made to allow clearance between the stencil shell and certain surfaces of the part being decorated. A major advantage of a blocked stencil is that the plastic part can be inserted in and removed from the stencil with ease, thereby making for fast production. It is also possible by blocking to design a stencil for use with multi-color spraying so that the contact points of the stencil will not touch "wet paint" areas.

Unblocked stencils are used whenever the parts to be sprayed are elastomeric or flexible and with rigid objects when there is no appreciable depth and when the decorative detail has been designed with ample clearance between painted sections. In most other cases blocked stencils should be used.

Both of these stencil types may embody other features such as bridging or baffling. Bridging is used

After spray mask has been completed and mounted, it is then pierced. Special tools, such as riffle files, saws, and fine drills are required to perform this piercing operation





Photos this page courtesy Wm. M. Fiore, Inc.

Five spraying operations complete decoration of doll's head (center). Masks were required for the following, reading clockwise from top center: white for the eye; black for the pupil; red for the lips; blue for the retina; and eyebrows and eyelashes

when the sprayed detail completely surrounds an "island", as in the letter "O". In such cases, the island must be supported in position by thin wires or plates connected to the main body of the stencil. Bridging is to be avoided whenever possible, since it complicates the spraying operation, generally making it necessary to move the spray gun or the part being sprayed to get around the obstacle offered by the bridging.

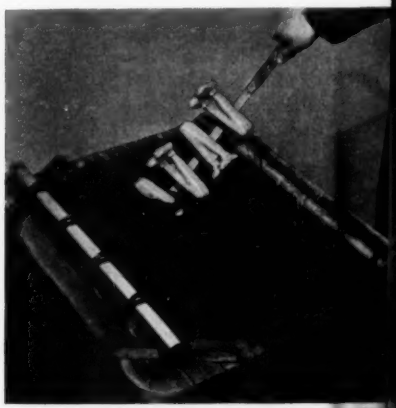
Baffles Separate Colors

Baffling permits the use of a single stencil for applying more than one color on an object. The baffles are actually partitions erected between openings to prevent a color from being applied to openings other than those for which it is intended. A typical application of baffled stencils is one for dolls' faces. Openings for spraying the lips and one color for the eyes may be provided on the same stencil, with partitions around the openings for the eyes rising verticaly from the stencil shell. These partitions protect the eyes from the red paint which is being sprayed on the lips and the lips from the eye paint. In some cases when using automatic machine spraying, four colors are sprayed simultaneously, each different colored area being protected from the other three by baffles.

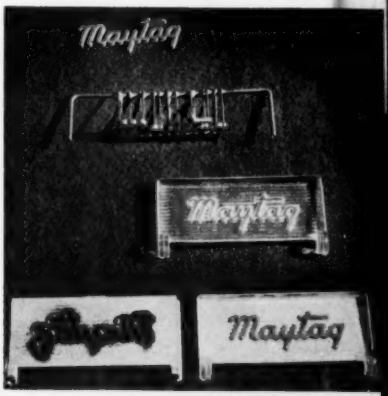
A hinged stencil may be used when two sides of an object are to be sprayed with one insertion in the stencil. Although this type of mask appears to have the advantage of high speed production, experience has shown that faster and better work can usually be done with two separate stencils.

Inasmuch as electroformed stencils are made by plating directly on one of the molded parts, it is important that the plating be done on molded pieces which have been produced exactly as they will be in full scale production. If the mold is single cavity, only one set of masks will be required, but if there is more than one cavity in the mold and there is a possibility of the slightest variation in dimension from cavity to cavity it is generally necessary to produce a set of masks for each cavity. Sometimes it will be found that a portion of the cavities of a multi-cavity mold will produce exactly similar parts, while another portion makes parts different from the first but accurate one to the other.

In any case, it must be understood than an electroformed spray mask is an exact reproduction of the matrix



Removing fixture from plating bath after copper shells have been built up on four matrices. These shells will be used as slush molds after finishing operations have been completed



Electroformed masking letters are mounted on bridges. Letters are inserted in depressed name in molded part; background color is sprayed, leaving lettering transparent. After mask is removed, letters are sprayed from back

and if there is any variation in the molded parts to be decorated, one mask will not be satisfactory.

Making Masks

The first step in the manufacture of a spray mask is to build up the blocking, a step which is eliminated when making unblocked masks. Whether the blocking be for the purpose of allowing clearance between mask and the part to be sprayed, for ease of insertion, or protection of wet painted parts, the operation is performed in the same manner. The "no contact" portions of the molded matrix are either built up by applying several coats of heavy lacquer or a layer of wax. The lacquer may be applied either by artist's air brush, paint brush, or—if large areas are to be covered—a standard spray gun. Each coat is allowed to dry before the next coat is applied. If wax is used, sections are cut to size and shape from a thin sheet of pattern-makers' wax, and these sections are applied to the matrix in proper position.

The blocked or unblocked matrices are now mounted on a plating fixture. In many cases, this fixture is an acrylic rod, generally of rectangular cross section, along the entire length of which is fastened a copper wire with a lead for connection to a source of electric current. Mounting is accomplished simply by gluing the plastic matrix to the acrylic rod. This entire assembly—copper wire, acrylic rod, and one or more glued-on matrices—is then sensitized; that is, the surface is made electrically conductive.

The electroformer must know in advance the exact composition of the plastic material the matrix has been produced from, because all sensitizing methods cannot be used with all types of plastics. Methods of sensitizing plastic products include: 1) chemical reduction; 2) applying a conductive powder or paint by spraying, dipping, or brushing; and 3) vacuum deposition (either metal evaporation or cathode sputtering.)[2]

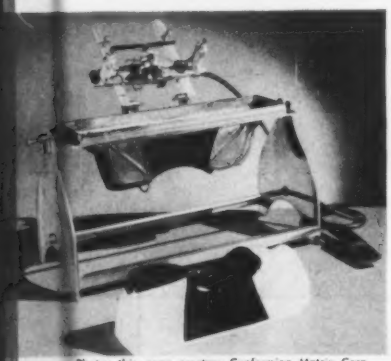
After sensitizing, the plating fixture and mounted matrices are placed in a plating bath and the copper wire connected to the source of plating current. Plating is carried on for approximately 10 min., after which the fixture is removed from the bath and visually inspected to be sure that a "strike" has been made over the entire area of the sensitized parts. If certain areas do not show a thin film of plate they are again sensitized, after which the plating operation is completed.

Electroplating is carried on in a copper plating bath until a copper shell approximately 0.050 in. in wall section has been built up on the entire outside surface of the matrix. This thickness will vary somewhat, with the depressed portions thinner than the raised areas.

Smoothing the Shells

After the plated matrices are separated from the plating fixture, but before the matrices are taken out of the electroformed shells, it is necessary to remove the trees (projections) that sometimes form during plating and to smooth up any other roughnesses on the outside of the mask. This smoothing may be done by filing or sanding.

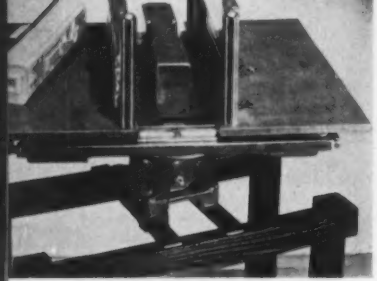
If power sanding is used, it should be carried out with a minimum of pressure, and the copper shell should be cooled at intervals with water. The shell should not be forced against the sanding wheel, as this may cause it to distort. Sanding of the edges should be done so that the motion of the belt or wheel is from the copper towards the matrix. The matrix thus acts as a backing during the sanding operation and eliminates the danger of the copper shell pulling away and distorting. Sanding the edges of the shell must be carried out until the edges are exactly parallel with the back of the matrix. If the shell is not sanded sufficiently, a ridge will be left on the edges of the shell; if sanding is



Photos this page courtesy Conforming Matrix Corp.

Special spray mask and air-operated clamp for spraying part of hobby horse

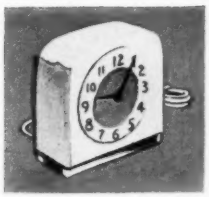
[2] See 1950 Modern Plastics Encyclopedia and Engineer's Handbook, p. 372.

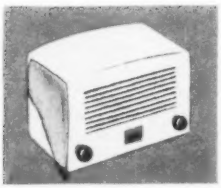


Air cylinders operate double spray mask to clamp a molded object to be painted

In rotary table-type machine, spraying is done at back and from underneath. Three colors can be sprayed at one time. Parts are moved from one mask to another as machine indexes

Housing Problems?





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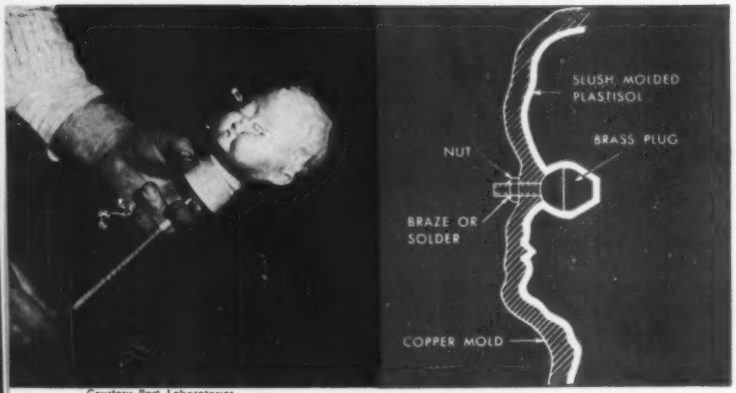


Courtesy Bart Laboratories

Left: Electroforming of a slush molding doll head mold has been completed. The acrylic pin will be withdrawn from eye centering hole, and the matrix removed from the inside, after which brass plugs will be assembled in position, as shown in drawing at right

carried too far, there will not be sufficient copper to protect the molded part when painting is undertaken.

After sanding, the outside of the shell must be polished. Polishing should be started at the approximate center of the shell and the matrix manipulated in such a way on the buffing wheel that the final points of contact are at the outer edge. With the top of the buffing wheel turning toward the operator, the shell should be held so that the edges are always down. This eliminates the possibility of the edge of the shell being caught by the buffing wheel and distorting.

Removing the Matrix

After polishing has been completed it is necessary to remove the matrix from the inside of the shell. For most thermoplastics this can be done by placing the shell under an infra-red lamp. It should not be left there any longer than necessary to soften the thermoplastic material. Once the material has softened it should pull out easily from the stencil.

Sometimes difficulty is encountered which requires that the thermoplastic matrix be melted out. In such cases the shell and matrix should be placed in an oven at approximately 600° F. for about 20 minutes. The bulk of the matrix material can then be removed and the balance dissolved with a solvent for the particular thermoplastic used. Under no circumstances are abrasives to be used for this operation.

Blocking wax can always be removed with infra-red, and any slight film remaining may be removed with carbon tetrachloride. Blocking lacquer may be removed with a thinner for the particular lacquer employed.

After all traces of blocking material and matrix have been removed, the entire shell must be washed in lacquer thinner and dried in sawdust. The clean stencil is then pickled for no more than 5 min. and washed thoroughly in clear running water.

It is nearly always necessary to provide a mounting plate for each spray mask. In one mounting method, the copper shell is placed open end down on a suitable metal mounting plate and the outline of the shell carefully drawn or scribed on the plate. This outlined section is then carefully cut out so that a perfect fit is obtained between the copper shell and the formed hole in the mounting plate. The two are then carefully soldered together, making sure that no flux or solder gets on the inside of the copper spray mask.

In another method[3] for providing a mounting plate, the plate is built up in the plating bath. To do this, the matrix is attached to a flat sheet of wax which has been cut to the size and shape desired for the mounting plate. The matrix and wax sheet are then fastened directly to the plating fixture, after which the mounting fixture, matrix, and wax sheet are sensitized. Subsequent electroplating produces a mounting plate and spray mask electroformed in one piece. Because the area connecting the mask with the mounting plate generally plates thinner than the other sections, it is usually reinforced with a layer of solder designed to give the assembly adequate strength.

Regardless of which method is used to produce the mask and mounting plate assembly, the next step is carefully to pierce or cut the shell to provide openings through which the paint will be applied.

[3] Patented by Conforming Matrix Co., Toledo, Ohio.

Name Plates

When masks for multi-color decoration such as transparent plastic horn buttons or two-color name plates are desired, somewhat different methods are followed. For example, if a plastic name plate is desired with letters of one color and an over-all background of another, the part is molded of a transparent material, with the letters molded into the back of the piece. The electroformer then sensitizes the entire back surface of the transparent molded piece and builds up a desired thickness of copper by plating. After this plate of copper is removed from the matrix, each of the letters is carefully sawed out. Suitable mounting wires, soldered at one or more points on each letter, connect to a mounting plate or mounting wire so that each letter is held rigidly in position.

With such an assembly the spraying operation consists of placing the mask in position, so that each depressed letter in the molded piece is filled up by a corresponding copper letter of the spray mask. The part is then sprayed with the background color. After the mask is removed, the entire back surface of the piece is sprayed with the contrasting color desired for the letters. The requirement of additional colors makes the operation more complicated, but the same general principle is followed.

Injection Molding Cavities

In the manufacture of electroformed cavities for injection molding, it is generally best to use a metal master matrix. However, if high accuracy is not required, a plastic or other non-conductive material may be employed. And be-

cause the strength of electroformed copper or nickel is generally not sufficient to withstand injection pressures, it is necessary that electroformed cavities be backed up by steel.

Once the electroformed shell has been built up to sufficient thickness around the matrix, the outer surface is machined to a pre-determined size so that it will be a snug press fit into a corresponding hole in its steel support.

Electroformed molds for low pressure molding are produced in approximately the same manner with the exception that the matrix is generally produced in plaster, especially if the mold is to be for a comparatively large piece. If the mold is to be for a smaller piece, acrylic stock can be used for the matrix. In any case, the sensitizing and plating operations proceed in the same manner as for the production of spray masks.

Doll's Eyes

An interesting development in the design of slush molds for the production of doll heads has recently been perfected by the Margon Corp., Bayonne, N. J., in cooperation with A. Buschow, chief engineer, Bart Laboratories, Belleville, N. J. This development makes possible the use of moving eyes in the flexible-type heads produced by slush molding plastisols. Up until the development of this new eye it has been impossible to incorporate moving eyes in such heads because of the interference of the eye counter-weight with the head stuffing.

This new method makes use of two separate enclosed moving eye units which contain the components. The problem was to find a method of mounting these eye units so they would be held firmly in position. The solution was to mold enclosed pockets inside the head, into which the eye-ball assembly is introduced through the eye opening. The flexibility of the plastisol makes the assembly simple and at the same time grips the eye unit tightly so that it cannot move out of position.

In producing an electroformed mold for such doll's heads, a wax or plastic model is used, in which is mounted a special plug for the eye component. The model or matrix as well as the exposed surface of the plug is sensitized, after which a plastic pin is placed in position in a hole drilled in the front part of the plug. When thus assembled, the plastic pin protrudes from the front of each eye of the matrix. The electroforming operation is then carried out until the required thickness of copper is built up, after which the pin is removed from the plug and the matrix and plug removed from the inside of the copper doll's head mold.

At this stage in the operation the mold has two small holes which are at the exact center location of each eye. A copper pin is then inserted through each of these holes, and a brass plug is assembled on the pin on the inside of the shell. This brass plug is the exact size of the moving eye assembly, and the front part of the plug is of the same shape and size as the eye opening required in the slush-molded doll head. The metal pin and plug are assembled firmly in position in the mold either by soldering or brazing. The mold is then ready for the slushing operation, and the resultant product will be complete with an enclosed pocket for each eye and with the eye opening molded clear.

Courtesy Bart Laboratories

An acrylic Fresnel lens, mounted in a plating fixture, is shown being lowered into an electroplating tank for electroforming, after having been made electrically conductive

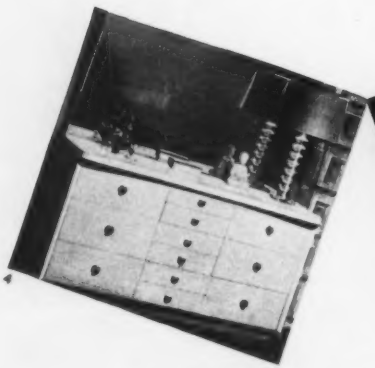
Another interesting use for electroformed molds is in the production of formed plates for pressing or post-forming acrylic sheet stock. One such application is for making the magnifying lenses used in television enlarging screens and produced from a thin sheet of acrylic by forming on one of its surfaces a large number of small concentric lenses. A master is made by engraving the required concentric circles of lenses on a metal or a non-metallic plate.

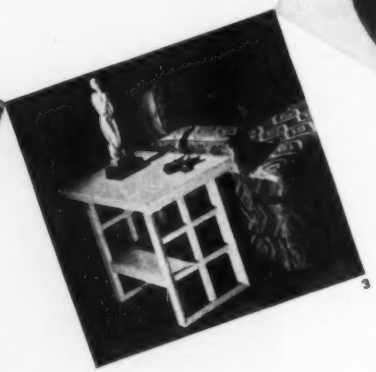
If a metal plate is used, an acrylic impression is taken and used as the electroforming matrix. If the master is a non-metallic material, it is used directly as the matrix.

When a non-metallic matrix is used, it is first metallized by precipitation of silver. It is then placed in a flash plating rack, and copper is plated to an approximate thickness of 0.002 inch. The master is then removed from the bath and inspected, after which it is assembled into a special electroforming fixture. This fixture is so designed that when the

(Continued on p. 90)

2 *Surface pressed by Parkwood Corporation.*
3 *Produced by Vogue, Chicago, Ill., surfaced with Formica, product of the Formica Insulation Company.*
4 *Surfaced with Panelyte pressed by St. Regis Paper Company.*
5 *Surfaced with Micarta, product of Westinghouse Electric & Manufacturing Company.*





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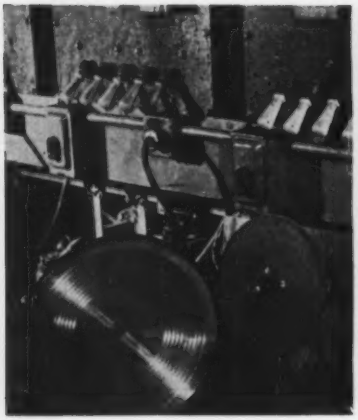


Photos this page courtesy Bart Laboratories

Left: Large diameter phonograph record "mother" about to be mounted on plating fixture of special high-speed phonograph record stamper plating unit. Right: Operator lowers "mother" into plating bath where metal record stamper is produced by electroforming

electroforming operation is carried out, an even deposit will be built up over the entire surface. This fixture, produced mainly from acrylic or laminated phenolic, has contact points assembled on it which contact the flash plating at several predetermined points. The contact points on the fixture are in turn connected electrically to the plating hanger which holds the assembly suspended in the plating bath.

Another function of this special fixture is to prevent the matrix from warping. It also acts somewhat like a frame to control the size of the finished mold.

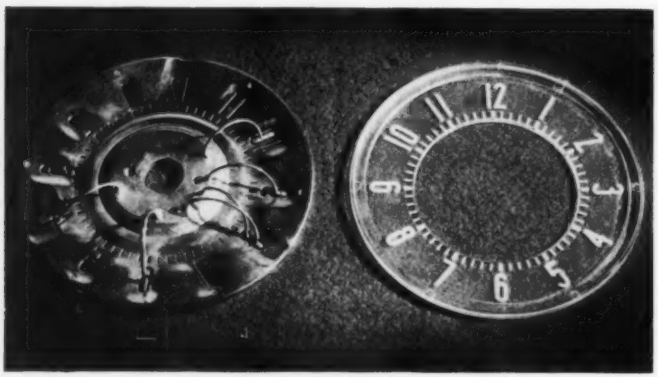
Electroforming of these acrylic molds is carried out until the desired thickness has been achieved, after which they are removed from the fixture. The thin flash underneath and outside of the plating fixture is then broken loose from the matrix, and the electroformed mold stripped off. The mold strips freely, so there is little if any possibility of deforming it during this operation. The mold is then mechanically cleaned, and the face is flash nickled and then flash chromed. It is then cut to size and the back surface turned, until it is completely smooth and the entire plate is of a uniform thickness, ready for pressing acrylic.

If a non-metallic master was the type originally produced, the first electroformed mold is used to make more acrylic masters or matrices. This is necessary inasmuch as one acrylic matrix can be safely used in the production of only one electroformed mold.

Credits

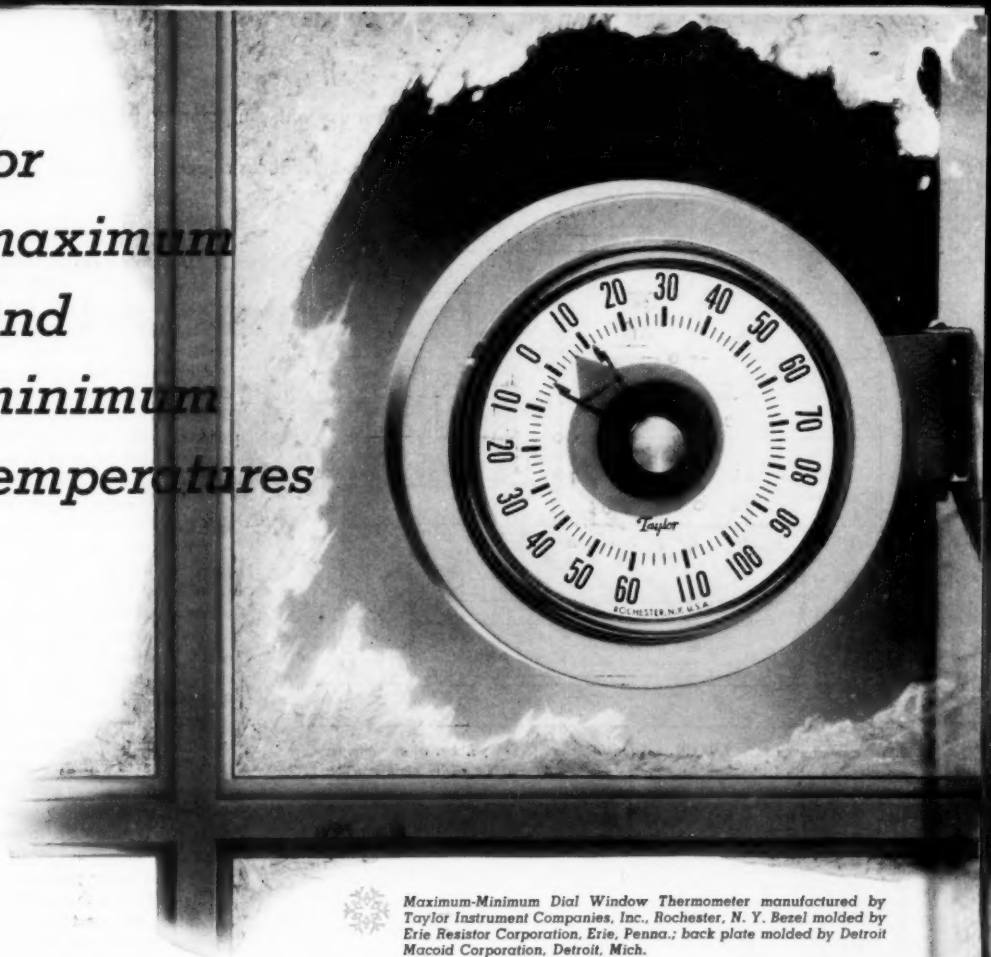
Material in this article relating to the design and production of spray masks was furnished by William Fiore, Wm. M. Fiore, Inc., New York, N. Y. Additional information referring to types of molds was furnished by A. Buschow, Bart Laboratories, Belleville, N. J.

Electroformed injection molding cavity for decorative closure. Electroformed shell is a press fit into steel support



Left: Electroformed spray mask protects all areas of transparent clock dial face, yet leaves depressed numerals open. Right: Spraying operation fills depressions with color

for maximum and minimum temperatures



Maximum-Minimum Dial Window Thermometer manufactured by Taylor Instrument Companies, Inc., Rochester, N. Y. Bezel molded by Erie Resistor Corporation, Erie, Penna.; back plate molded by Detroit Macoid Corporation, Detroit, Mich.

Weatherproof Tenite bezel and back plate house the handsomely designed Maximum-Minimum window thermometer, which registers hot and cold extremes as well as accurate present temperature. The lustrous gray bezel forms protective outer casing for the round glass dial. Translucency of the white Tenite back plate affords a well-lighted instrument face, makes red pointers and black numerals readily visible at a glance. A practical material for instrument housing, tough Tenite is noncorroding and virtually unbreakable. It offers an endless list of chipproof colors — transparent, translucent, or opaque — and can be molded or extruded in an infinite variety of shapes. Other successful outdoor uses of Tenite include tool and knife handles, lawn mower rollers, football helmets, and a wide selection of fishing equipment. For further information about the properties and many applications of Tenite, write Tennessee Eastman Company, Division of Eastman Kodak Company, Kingsport, Tennessee.

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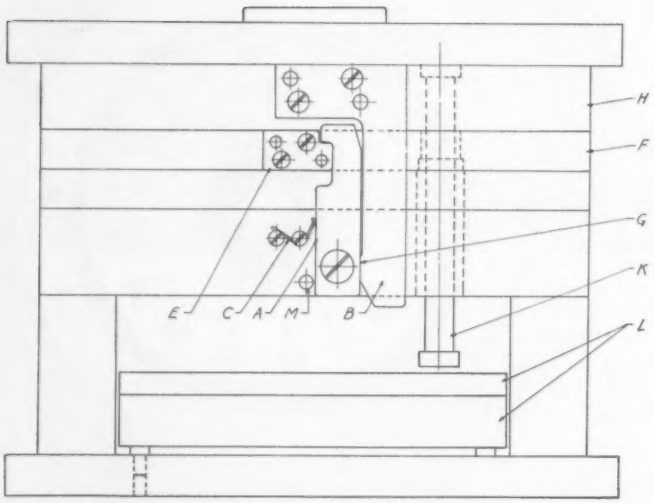
Information regarding Tenite is also obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Leominster (Mass.), Los Angeles, New York, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, and Seattle; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

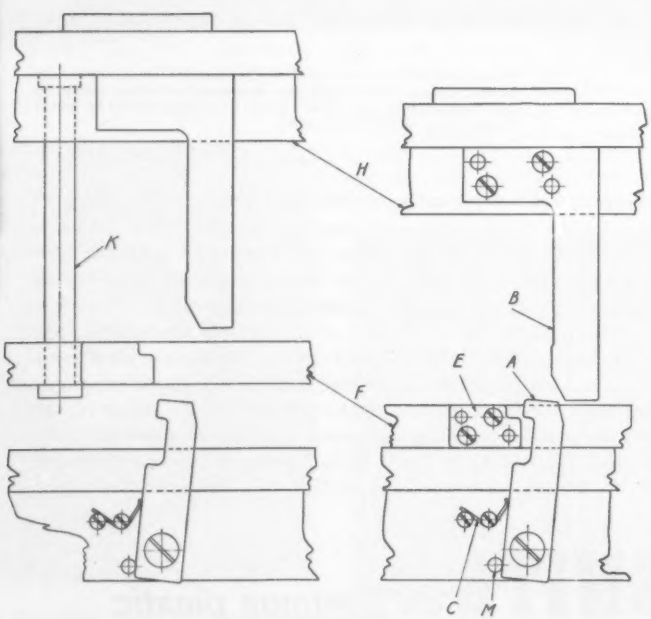
Gate Breaker

Developed for use with pin point gating or thin gated parts, automatic device speeds operation, reduces rejects

by CLIFF BOSSMANN*



With the mold closed, latch (A) is maintained in the locked position by the retainer cam (B). This action serves to hold the force plate (F) and the cavity plate together



Right: Portion of mold-opening operation just after retainer cam (B) has released latch (A), thereby permitting mold to open completely as shown at left for ejection of pieces

THERE are many advantages to be gained by breaking the gate from a molded piece while the mold halves are still closed. For example, styrene tends to become brittle as it cools, and a gate will frequently fracture into the molded piece if it is cut or broken off after removal from the mold. When the gate is broken with the mold still closed, however, the material is still warm, and little if any fracturing occurs.

Gate breaking in the mold also has the obvious advantage of speed of operation. The operator is relieved of the job of cutting or otherwise breaking the gates after the complete shot has been removed.

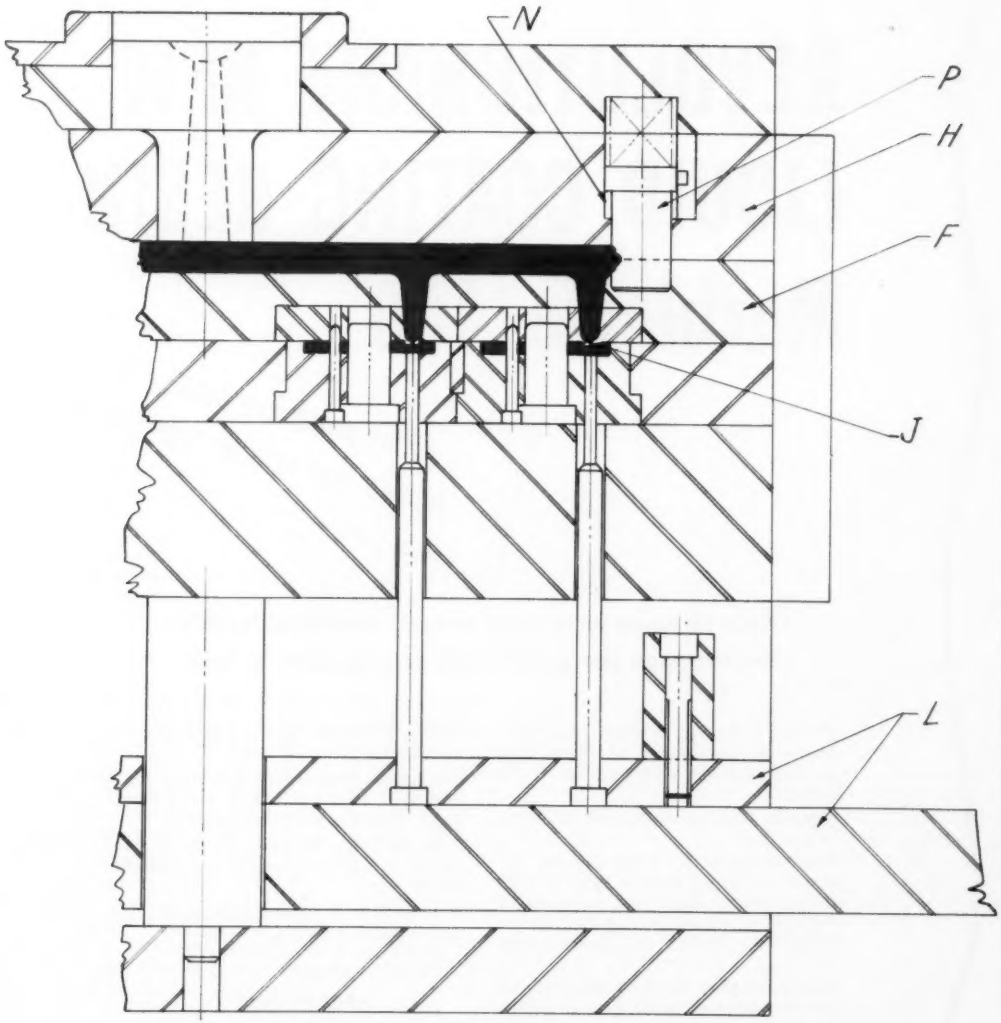
While there have been other molds designed which cut or shear the gate in the closed mold, the device described here does not make use of shear pins; it was developed for use with pin point gated parts or parts with thin gates.

The design of the gate breaker includes a moving plate in addition to the normal number of plates used in the mold. This plate is similar to an auxiliary runner plate and must be incorporated in the mold design. In operation the nests or mold plates for the force plugs and cavities are held firmly together by rugged latches until the runner plate has moved sufficiently far to fracture the pin point gates. As the mold travel continues, the latches are unlocked, thereby permitting the mold halves to open and the parts to be ejected. When the molding cycle is repeated, the mold halves close and are locked, after which the runner plate moves into position and the mold is ready for injection.

By reference to the drawings, the following description will explain the operation of this device.

When injection is completed, the molten plastic has not only filled out the runners and cavities but has also flowed into a drilled undercut spot on part (P). When the upper half of the die rises, plate (F), which forms the upper portion of the molded part, remains stationary, be-

* Tool Design Dept., National Cash Register Co., Dayton, Ohio.



Section of mold showing runner, auxiliary sprues, and cavities filled out; material has flowed into undercut spot in (P). With force plug and cavity plates locked by latch, plate (H) separates from plate (F) pulling (P) with it, thus fracturing gate (J)

ing retained by latch (A). This latch has a retaining effect as long as surfaces (G) are contacting. When plate (H) has risen approximately ⅜ in., the gate (J) is broken, leaving the molded part separated from its gate, runner, and sprue. The fracturing is effected when the lower side of the flange on (P) bottoms in the hole (N) because the drilled spot in (P) anchors the solidified sprue.

Plate (F) remains in place until surfaces (G) are no longer contacting, at which time latch (A) swings away from catch (E) and releases the plate. Latch (A) is actuated by a wire spring (C) and is stopped by dowel pin (M).

After plate (F) is released, lifter (K) contacts the lower surface of the plate and raises it away from the molded product. This is done to provide unloading room.

Ejector pins mounted in the stripper plate assembly (L) then push the molded part off its core pins.

When the die starts to close, the chamfer on latch (A) contacts the chamfer on retainer (B) which forces the latch over to its normal closed position. When surfaces (G) contact, the plate (F) is securely held in position as before. After the die is closed, it is ready for a shot of molten plastic. This latching device is used on both ends of the die to prevent the mold halves from cocking as the runner plate moves away from the closed mold.

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Polyvinyl Alcohol

by NORBERT PLATZER†

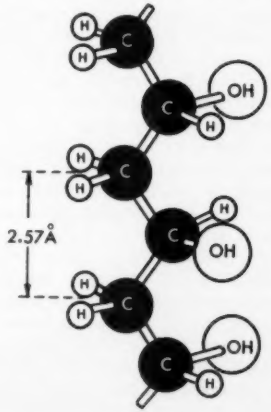
Polyvinyl alcohol (PVA) is used as an emulsifier, an intermediate in the manufacture of polyvinyl acetals, and as a material for textile sizing and finishing and paper coating. Several applications as replacements for leather were developed during the war in Germany.[1] The outstanding characteristics of polyvinyl alcohol are solvent resistance, gas impermeability, nontoxicity, nonstatic electrically, flexibility, strength, and toughness. The structure, plasticization, water-insolubilizing treatments, and principal applications of polyvinyl alcohol are described in this article.

VINYL compounds are derivatives of ethylene in which one hydrogen atom is replaced by various other atoms or groups. The simplest derivative, vinyl alcohol, is unknown as it changes immediately into acetaldehyde by atomic displacement[2]. In 1924 Herrmann and Haehnel[3] observed in saponifying polyvinyl esters that there resulted not only a brown insoluble mass[4] of hydrocarbons[5], as previously described, but also whitish flakes which could be analyzed as polyvinyl alcohol. Polyvinyl esters have remained the only source for polyvinyl alcohol. Of all the various esters polyvinyl acetate has proved to be the most convenient one, although several other organic[6] and inorganic[7] esters, e.g., polyvinyl halides, have been claimed to be more attractive. Acid and alkaline hydrolysis processes for the manufacture of polyvinyl alcohol have been previously described[8].

Structure of Polyvinyl Alcohol

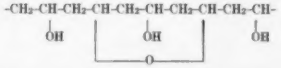
Halle and Hofmann[9] observed an identity period of 2.57 Å. along the axis of a stretched polyvinyl alcohol fiber in the X-ray diffraction patterns. This indicates that the chain has the normal aliphatic hydrocarbon configuration, whereby the monomers are bound in a head to tail configuration. This observation was proved by Marvel and Denoon[10] as well as by Mooney[11]. Brunn[12] has shown that the hydroxyl groups are randomly placed in left and right position (Fig. 1).

1—Structure of molecule of polyvinyl alcohol showing hydroxyl groups randomly placed in left and right position

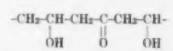


The degree of polymerization of the initial polyvinyl acetate (molecular weight 30,000 to 200,000) is generally taken as a measure of that of the polyvinyl alcohol, although the chain length is about one-third shorter than theoretically expected. Staudinger[13] and McDowell and Kenyon[14] postulate that degradation occurs on weak spots of the molecule originated by the peroxide catalyst, acetaldehyde, or atmospheric oxygen.

In molding or similar processing polyvinyl alcohol may be heated up to 140° C. Under the influence of heat it changes to a brown color and splits off water. It was found that only a certain portion of the remaining hydroxyl groups can be esterified. It was therefore considered that a certain amount of cyclic ethers are produced in the molecule of the following structure[15]:



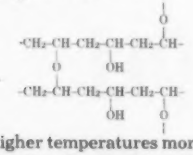
A small amount of such ether linkages may be already present in the original polyvinyl alcohol, as the sum of hydroxyl and remainder ester groups empirically evaluated is less than the theoretical number. Clark and Blont[16] suggest on the contrary that polyvinyl alcohol contains carbonyl groups randomly distributed all along the chain to the extent of about 0.4 mole percent:



In the case of heat treatment the ether linkage is more plausible. There the binding occurs not only

* Reg. U. S. Pat. Office
† Monsanto Chemical Co., Plastics Div.
‡ Refer to references on page 166

between two hydroxyl groups of the same chain but also between two adjacent molecules resulting in a network throughout the plastic, making it completely insoluble in water and in all organic solvents:



At higher temperatures more water can be split off[17], resulting finally in a polyethine configuration, $(C_2H_2)_n$. The proportion of free hydroxyl groups and ether linkages is critical in the treatment of unplasticized PVA articles. Too many ether linkages cause brittleness; too many hydroxyl groups keep the article hygroscopic and soft.

Untreated polyvinyl alcohol does not contain any double bonds, and is, therefore, not vulcanizable. Herrmann and Haehnel[3] erronously described the formation of hard rubber-like materials by treating with sulfuric monochloride and carbon disulfide at room temperature or by molding with sulfur and piperidine[18]. This erroneous statement has been cited in various books and journals[19]. In repeating this experiment with and without vulcanizing accelerators no linkage between sulfur and the polymer could be observed. After a very long heating period and dehydration, a small amount of sulfur was bound, but the final product was very hard, brittle, and useless.

Plasticization

Plasticizers are generally high boiling solvents for the individual resin. For polyvinyl alcohol two groups of plasticizers can be distinguished: the hygroscopic or indirect plasticizers and the real or direct plasticizers.

Indirect Plasticizers—Glycerol[20]; ethylene glycol; diethylene glycol; triethylene glycol[21]; butylene glycol-1,3; butylene glycol-1,4; butane-triol-1,2,4; trimethylolpropane; 2-methyl-butanediol-1,3[22]; hexanetriol; and various similar high boiling liquids soluble in water and hygroscopic are indirect plasticizers. Polyvinyl alcohol is insoluble in these anhydrous substances, in contradiction to the statement of Herrmann and Haehnel[3]. Only the water bound to the hygroscopic plasticizer has a swelling and dissolving effect, and acts as a real plasticizer. In a dry atmosphere these substances lose their water, and the "plasticized" polyvinyl alcohol becomes hard and less extensible.

Direct Plasticizers—Of more than 350 various substances tested, only acids have shown a swelling effect on polyvinyl alcohol. Organic acids, such as formic, acetic, lactic, glycollic,[23] or citric acid cannot be employed as plasticizers because they form esters with polyvinyl alcohol. Sulfuric acid causes discoloration and decomposition. Hydrochloric acid is too volatile, but is used for cementing PVA belts together[24]. Only phosphoric acid[25] brings about the required swelling effect and is hygroscopic and nonvolatile. Together with glycerol or glycol it does not remain permanently in the plastic, as it forms to a small extent esters, analogous to the lecithins, which are volatile. Nevertheless, despite intensive research, no better and cheaper plasticizer than phosphoric acid has been brought to light.

Among the indirect plasticizers glycerol is preferred because of its higher hygroscopicity and lower volatility. But on the other hand it confers less cold resistance than butylene glycol. So for the belting application, a mixture of glycerol and butylene glycol is generally chosen.

Tanning Methods

The greatest disadvantage of polyvinyl alcohol for most applications is its water solubility and sensitiveness to moisture. Many efforts have been made to reduce its hygroscopicity by means of tanning or other treatments. The simplest method to increase the water resistance is aging or heat treatment[26]. It was observed that PVA driving belts warehoused for more than 6 months are less hygroscopic than new ones, and that worn belts are not completely soluble in hot water. At normal temperature, ether formation takes place to a small extent; a complete insolubilization, however, is only possible at elevated temperatures.

Treatment with Inorganic Tanning Materials—Stannett[27] indicated a treatment with phosphoric acid for increasing the water resistance of polyvinyl alcohol. This erroneous statement came probably from a misunderstanding of Burghausen's after-treatment of PVA driving belts by immersing the belts in phosphoric acid for plasticization and not insolubilization.

PVA blankets and conveyors employed in textile intersecting and combing machines require not only a high phosphoric acid content (28-32%) for good flexibility, but also water repellent properties to stand the high humidity of air-conditioned spinning mills. So these blankets were immersed in a bath of 60% phosphoric acid containing 1% chromic phosphate. Higher chromium contents had proved to give a better moisture resistance but also a greater stiffness and brittleness. The chromium tanning was only applied to the blankets which could be made endless before immersing, but not to normal PVA driving belts, because the chromium tanning made cementing difficult or impossible.

Another most interesting application of chromium tanning is the preparation of lithographic printing plates, known as "Off-set Drawin Process (Dr. A. Wacker Co.)." As a substitute for gelatin, a PVA film with ammonium dichromate is poured on a zinc plate[28]. After exposing to light, the exposed PVA portion of the light sensitive film becomes insoluble. The unexposed portion is washed out and the zinc plate can be etched in the standard manner. This off-set printing is widely used for illustrating books and magazines, and has the advantages of greater uniformity and higher light sensitiveness than are to be found in natural gelatin.

Other inorganic tanning agents are sodium or potassium dichromate, vanadium, titanium, zirconium, and cerium salts[29], and ferric chloride[30]. With borax[31], increase of viscosity up to complete gelatinization can be observed. This reaction is extremely sensitive and can be used for detecting boric compounds. By heating in caustic or ammonia, water solubility can be reduced. Alkali solutions are employed as a precipitating bath in PVA wet spinning processes. A water insoluble product is obtained by treating with cuprous ammonium hydroxide[32], but such treatment makes PVA articles completely dark and brittle. This method is unsuitable for beltings, but could be applied to bristles.

Treatment with Organic Substances—Instead of ammonia, amino polymers, such as proteins (chitin),

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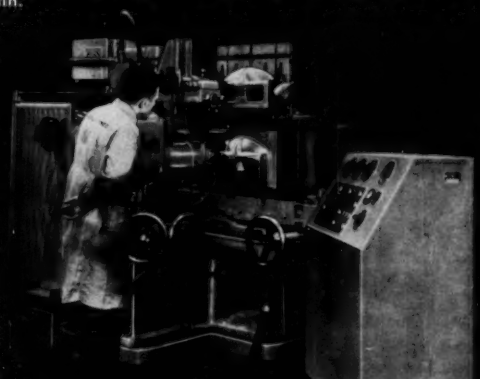

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amides, aminocellulose, and nitrogen-containing resins, can be mixed with polyvinyl alcohol[33]. For a period of two years ½ to 1½% of an emulsifiable sulfonated mineral oil (Shell 154) was added at Burghausen to the cast sheets of polyvinyl alcohol in order to give the final driving belt a greater water repellency. Other organic substances, such as tannin[34], Congo red[35], benzo purpurin, and similar dyes and tanning matters, are to a certain extent effective but are only of limited applicability. Sometimes they were used in connection with inorganic tannings, e.g., Congo red with borax or ferric chloride followed by tanning treatment.

Esterification and Condensation—Many experiments have been carried out to replace the pure polyvinyl alcohol by an incompletely hydrolyzed product or to use a mixture of two grades with low and high saponification numbers[36]. For a period of four years all PVA sewing laces made at Burghausen were prepared from a mixture of 75 parts PVA of SN 30, and of 25 parts PVA of SN 120. But because of lower mechanical properties this process was abandoned. Esterification of PVA with other acids, such as formic, oxalic, maleic acid, etc., also gave unsatisfactory results.

It is well known that polyvinyl alcohol can easily be converted into acetals by treating with aldehydes, such as formaldehyde, acetaldehyde, or butyraldehyde, in the presence of a small quantity of mineral acids at normal temperature[37, 38]. To apply a water-resistant surface to a PVA driving belt plasticized with phosphoric acid, it was only necessary to immerse the belt in the aldehyde for a few minutes[38]. This treatment is certainly the most simple and is used in this country for the manufacture of bath sponges. But it can not be employed for driving belts, because the acetalized surface does not allow cementing of the belt ends and becomes cracked after a much shorter run than the pure polyvinyl alcohol. Addition of polyvinyl acetal plasticizers, such as triethylene glycol dihexoate, dibutyl sebacate, adipates, or phthalates, did not considerably improve the flexibility of the acetal surface.

Of all the treatments with condensing and water repellent agents for reducing hygroscopicity, aldehyde condensation is still the most promising one, and one day an improved water-resistant driving belt of PVA strength and flexibility may be available. Such a belt would probably be superior to those made of natural leather or of other types of synthetic materials.

Table I—Comparative Properties of Synthetic Fibers

Fiber	*Dry strength*	*Wet strength*	*Water Absorption at 60% R.H.*
	g./den.	*g./den.*	*%*
PVA	5.5	3.3	25.0
Nylon	5.0	4.5	3.5
PVC	4.16	4.0	2.0
Silk	4.7	3.9	11.0
Cellulose acetate	3.4	2.1	6.5
Cordura	1.8	0.9	—
Viscose	1.5	1.0	12.0
Wool	—	—	13.0

Textile and Paper Treatments

Polyvinyl alcohol is one of the best textile sizing agents[39]. Because of its high price, it is mainly applied to expensive fibers, such as nylon. Its great advantage is its elasticity, not splitting off or cracking on highly elastic yarn. To a greater extent it is used as a textile finishing agent[40]. Rayon and staple fiber fabrics are treated with polyvinyl alcohol in combination with formaldehyde or ethyleneimine, or with condensation products of formaldehyde with urea, melamine, or formamide to obtain a full wash-fast handle and to reduce the swelling of rayon by water.

Mixed with a small amount of formaldehyde, polyvinyl alcohol is used as an adhesive for paper to increase strength, grease-proofing, and for making glassine paper. It has been used for sticking fabric to leather, as in the interiors of bags and cases. Book covers, lamp shades, and bags were reinforced by coating with PVA films[41], which can readily be printed on or can be hot-iron engraved.

PVA is used in a 10% aqueous solution mixed with 5% polyvinyl acetate emulsion as a lacquer for cork and leather spinning cylinders to prevent wrapping of the fibers due to static electric charging.

Synthetic Fiber

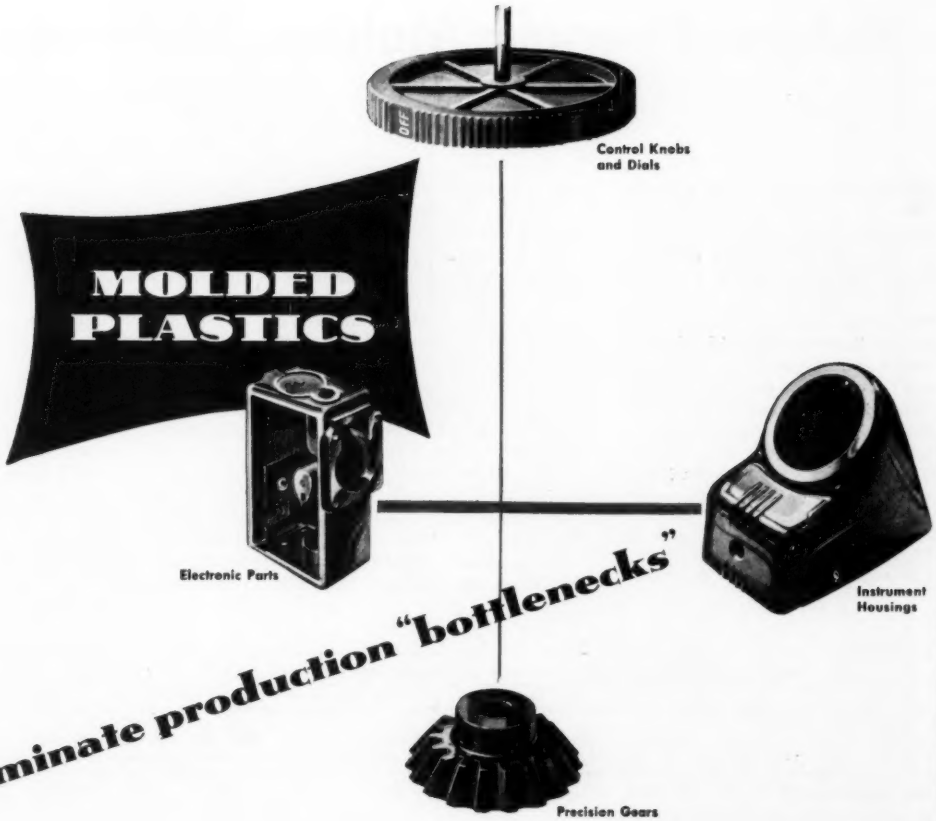
Experiments in spinning PVA fiber have been carried on at Burghausen and by Lee and Kawakami[42] in Japan. The procedures developed comprise spinning an aqueous solution of PVA through spinarettes into precipitating baths, such as aqueous solutions of potassium sulfate or a mixture of sodium-ammonium sulfate-bisulfate at 35°C. The dried and stretched fiber is superior to all known fibers with respect to its tensile strength and flexibility, but is water soluble and hygroscopic (see Table I).

PVA fiber can be recommended for textile fabrics embedded in rubber or plasticized PVC where it is sealed against external influences, but where excellent mechanical properties are required, such as in V-belts, conveyor belts, tires, raincoats, and the like. In Japan PVA textile fabrics are made insoluble by treatment with formaldehyde.

Polyamide, acrylonitrile, saran, and PVC fabrics have a very low ability to absorb water or perspiration, so stockings or underwear made of them are colder in wearing than those of natural silk or wool. Their capability of absorbing moisture can be increased either by treating the fabrics in PVA solution or by mixing PVA fiber with them when twisting threads and subsequently insolubilizing the PVA.

PVA bristles are superior to all known synthetic and natural bristles in flexibility, but their applicability is very limited due to their water solubility. At Burghausen thin bristles were made by extrusion and thicker ones by cutting out from foils. Their moisture resistance was improved either by heat treatment, acetaliza-

(*Continued on p. 161*)



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Rubber-Phenolic Molding Materials*

by W. GOSS†

NATURAL rubber and phenolic resins are not compatible, and blends of the two materials result in products of non-uniform composition. However, the Buna N type of synthetic rubber, made by copolymerization of butadiene and acrylonitrile, is compatible with phenolic resins, and this combination of binders has opened up new opportunities for the improvement of the phenolics in shock resistance and ability to withstand vibration and fatigue. This has been accomplished without sacrificing moldability, bulk factor, and other highly desirable characteristics of the standard phenolic molding powders.

The first of the rubber-phenolic formulations was a woodflour-filled molding powder. These materials were applicable to standard and automatic molding machines. The enthusiastic acceptance of this improved impact material indicated the desirability of extending the use of this combination of binders to other filler formulations. Consequently, further developments were carried out with cotton flock filler, cotton fabric filler, and asbestos fiber filler.

It is generally agreed that standard impact tests, such as the Izod test, are not truly indicative of the exceptional toughness of these products. Many companies have investigated various methods of determining more accurately in the laboratory just what can be expected of rubber-phenolic moldings in services. Actual performance of rubber-phenolic compounds has been found to be far superior to similar formulations of straight phenolic compounds.

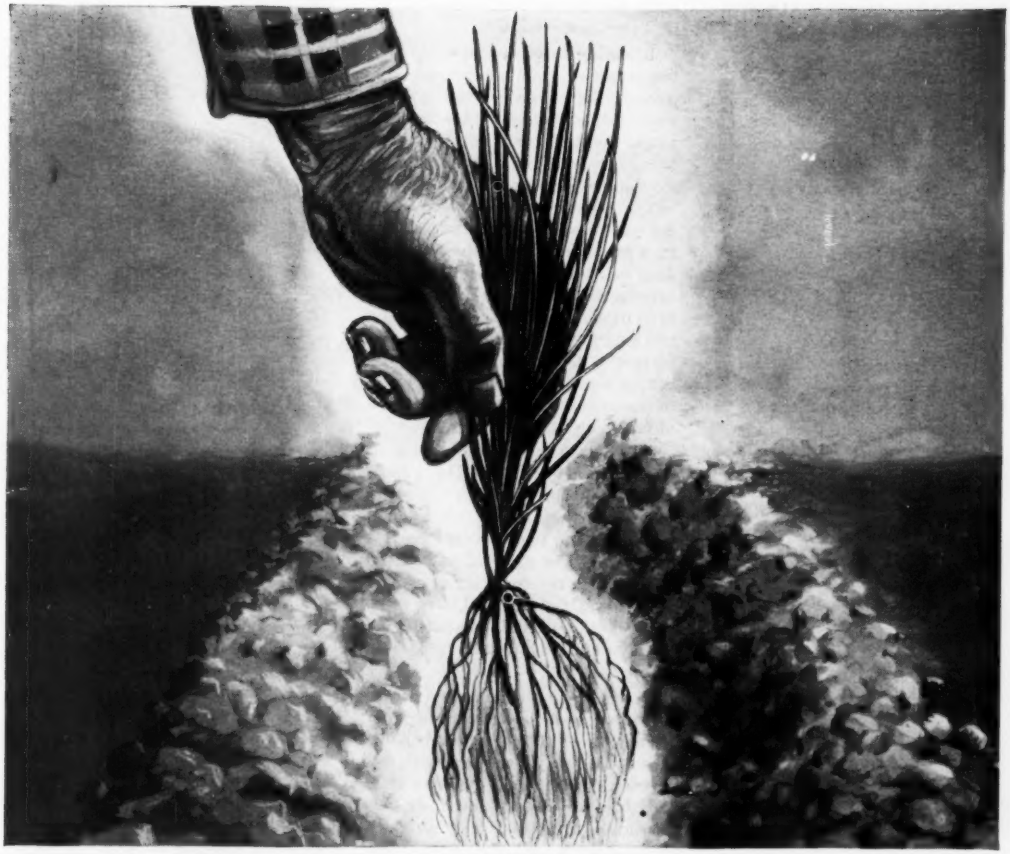
Drop-ball impact tests were made on identical moldings from both phenolic and rubber-phenolic formulations containing four fillers —woodflour, cotton flock, cotton fabric, and asbestos fiber. A channel-shaped piece, 8 in. long, 1¾ in.

* Presented at the 1950 Fall Meeting of the American Society of Mechanical Engineers in Worcester, Mass., before the Rubber and Plastics Division.
† Chemical Dept., General Electric Co., Fittsfield, Mass.

Table I — Comparative Impact Strengths of Phenolic and Rubber-Phenolic Molding Materials

	Woodflour filler		*Cotton flock filler*		*Cotton fabric filler*		*Asbestos filler*	
Property	*Phenolic* G-E 12490	*Rubber-phenolic* G-E 12487	*Phenolic* G-E 12401	*Rubber-phenolic* G-E 12808	*Phenolic* G-E 12444	*Rubber-phenolic* G-E 12809	*Phenolic* G-E 12431	*Rubber-phenolic* G-E 12494
Izod impact strength, ft.-lb./in. of notch	0.36	0.56	0.66	1.00	1.30	2.30	0.30	0.40
Drop ball impact, increasing height								
To crack, ft.-lb.	0.92	3.33	1.62	4.13	3.16	10.3	0.42	3.14
To break, ft.-lb.	1.51	9.48	5.54	14.3	10.0	33.9	0.42	6.50
Drop ball impact, fatigue energy								
To crack, ft.-lb.	0.71	4.80	0.52	13.1	1.77	13.9	0.48	1.00
To break, ft.-lb.	3.34	37.9	7.65	51.6	15.5	84.2[b]	0.48	7.90
Flexural strength, p.s.i.	10,000	7000	10,000	8000	10,000	7000	9500	7000
Modulus in flexure, 10^6 p.s.i.	1	0.25	1.0	0.45	1.0	0.35	1.0	0.5
Tensile strength, p.s.i.	7900	4500	6000	4500	5500	3500	5500	4000
Compressive strength, p.s.i.	25,000	16,000	25,000	15,000	25,000	15,000	20,000	16,000
Specific gravity	1.37	1.31	1.37	1.33	1.38	1.32	1.71	1.63
Water absorption, % in 48 hr.	1.0	2.5	0.8	2.5	1.0	2.1	0.1	0.40
Shrinkage[a], mils/in.	5.0	9	3.5	4.5	2.5	4.5	3.0	6.5
Heat distortion temperature, °C.	145	125	160	125	150	115	150	135
Dielectric strength, short-time								
60 cy., 25°C., v./mil	350	300	325	325	300	250	300	350
60 cy., 100°C., v./mil	150	125	125	75	70	80	120	85
Dissipation factor								
60 cy., dry	0.30	0.14	0.208	0.50	0.42	0.45	0.35	0.15
10^6 cy., dry	0.06	0.08	0.0515	0.098	0.06	0.09	0.27	0.125
Dielectric constant								
60 cy., dry	10.0	9.0	9.0	15.7	11.1	15	42.0	15.0
10^6 cy., dry	5.0	5.0	5.5	5.1	5.1	5	7.6	5.00

[a] Lengthwise shrinkage of 5- by 0.5-in. test bar from dimension of mold cavity after test bar is removed from mold and cooled to room temperature.
[b] Not completely destroyed.



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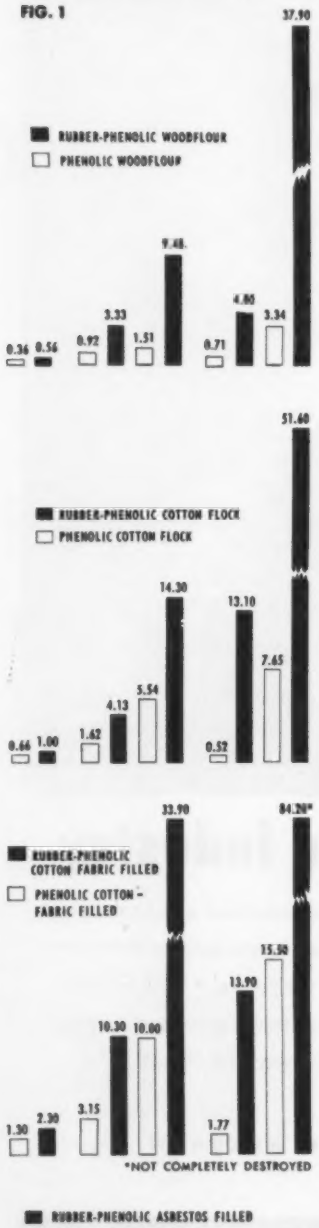
COMPARATIVE IMPACT STRENGTHS, FOOT-POUNDS ENERGY

FIG. 1



wide, and 1½ in. high with a 3/32 in. wall thickness, was used.

In one series of tests the increasing height of drop method was employed. The weight of ball used is that which will crack a test specimen when dropped from not less than 13 in. nor more than 19 inches. The load in foot pounds was noted when the part first cracked and also when the part broke beyond usefulness. In a second series of tests a fatigue drop ball test was run on the channel-shaped specimens. The height of drop in the fatigue test is 75% of the cracking height established in the increasing height method. The total energy was noted at the point of first indication of failure and at the point of complete destruction.

The data obtained are shown in Table I and Fig. 1. They show that the rubber-phenolics withstand shock loads one and a half to eight times greater than straight phenolics before first signs of failure and shock loads two to 15 times greater than straight phenolics before complete failure. Other properties of these materials are also shown in Table I.

Some of the advantages of the rubber-phenolic molding compounds compared to the straight phenolics are as follows: 1) greater shock, vibration, and fatigue resistance; 2) less breakage in shipping, handling, assembly, and cleaning; 3) no sacrifice in performability, moldability, and appearance; 4) lower cleaning costs, thinner cut-off, and less hand filing or spindling; 5) good thermal shock-resistant resiliency from -40 to 120° C.; 6) low-cost assembly operations by use of self-tapping screws and pressed-in inserts; 7) stronger parts when present mold design produces parts that are too weak; 8) permits Stokes press operation of woodflour-filled phenolic; 9) opens up new impact fields with rag-filled rubber-phenolic molding compositions; 10) permits decrease in weight of molded parts, with concomitant lower cost and greater strength; and 11) parts remain operative even after initial failure has occurred.

The comparative costs of the phenolic and rubber-phenolic materials are shown in Table II. The molding cycles in many instances can be equal to or within 10% of the molding cycles required for standard phenolic materials. Occasionally

Conducting drop-ball impact test on rubber-phenolic handle of soldering gun

knock-out pins will have to be enlarged or placed more frequently as the material is less rigid on extraction. To avoid any tendency of mold sticking, it is recommended that molding surfaces be chrome-plated. Where possible, dead-ends should be avoided; if this cannot be accomplished, the mold should be vented to allow the release of the gases formed during the molding operation.

These new rubber-phenolic materials will open up new applications for thermosetting molded plastics. The greater strength characteristics obtained without increase of bulk factor and cleaning cost will allow the molder to produce stronger parts in most existing molds when requirements for mechanical performance are increased.

Table II — Comparative Costs of Phenolic and Rubber-Phenolic Molding-Materials

Molding material	*Cost ¢/cu. in.*
Woodflour filler	
Phenolic	0.931
Rubber-phenolic	1.60
Cotton flock filler	
Phenolic	1.45
Rubber-phenolic	2.11
Cotton fabric filler	
Phenolic	1.99
Rubber-phenolic	2.71
Asbestos filler	
Phenolic	1.19
Rubber-phenolic	2.12

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Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

MILITARY STATUS OF FLEXIBLE PACKAGING. C. A. Southwick, Jr. Modern Packaging *24*, 121-4 (Nov. 1950). Properties and requirements of flexible packaging materials made of paper, metal foil, and plastic films are discussed.

PLASTICS AND RADIOTHERAPY. G. Hunnings. Plastics (London) *15*, 272-3 (Oct.-Nov.-Dec. 1950). Plastic devices for use in radiotherapy are made of polyvinyl chloride, cellulose acetate, and acrylic plastics.

STUDIES OF THE STRENGTH OF GLUED LAMINATED WOOD CONSTRUCTION. A. D. Freas. ASTM Bull. *1950*, No. 170, 48–59 (Dec. 1950). The results of two longtime research programs on the strength and use of glued laminated wood constructions are reported. Recommendations for the design of glued laminated structural members are given.

WHY CONSIDER ADHESIVE BONDED STRUCTURES? S. Gunthorp and R. G. Naugle. Product Eng. *21*, 138–43 (1950). The use of adhesives in the construction of aircraft is discussed. The properties of several commercial adhesives are presented. Adhesives are used because they give 1) strong joints, 2) economical construction, 3) smooth joints, 4) corrosion resistance with dissimilar materials, 5) strong bonds with thin sheet metal, and 6) resistance to fatigue.

WHAT ABOUT ELECTRETS? E. R. Nielsen. Electrical Manuf. *46*, 96–8 (Dec. 1950). The manufacture, properties, theories, and applications of electrets are reviewed. Abstracts of 42 references are given.

THE HAZARDS OF SYNTHETIC PLASTICS. J. V. Grimaldi. Mechanical Eng. *72*, 987–9 (Dec. 1950). Desirable safety precautions in the manufacture of the resins, in the fabrication of plastic products, and in the grinding of scrap plastic are discussed briefly. It is concluded that concern over the fire hazards of synthetic plastics probably has arisen out of the experiences with cellulose nitrate in the early days of the plastics industry. The burning of most of the plastics themselves should not cause any more concern than the burning of wood, woolen fabrics, or fats and oils. Some plastics such as vinyl chloride do not support combustion but must be kept lighted by a separate source of heat. The toxic products of combustion, while they must be considered, are for the most part of no greater danger than carbon monoxide, and this compound must be considered in the case of any fire. Concerning other toxic products, the more common materials just mentioned will produce poisonous compounds when burned which are similar to those produced by the various types of plastics.

Materials

PLASTIC FLOW PROPERTIES OF CASEIN. L. Hougen and N. J. Hipp. J. Colloid Sci. 5, 218–27 (June 1950) Plastic flow measurements of commercial and laboratory-prepared caseins were made with the Rossi-Peakes flow tester. Flow properties of casein samples containing different amounts of moisture were determined at temperatures from 50 to 140°C. and pressures from 500 to 3000 p.s.i. Only minor differences were found in the "flow temperature." The transition in flow properties corresponding to a water content of about 21%, as described by Haller, could not be demonstrated. A tridimensional graph for rennet casein is presented which illustrates the temperature, pressure, and water-content requirements necessary to obtain a given plastic flow.

PROPERTIES OF POLYVINYL CHLORIDE COMPOUNDS. P. V. Smith, Jr., R. G. Newberg, and D. W. Young. Ind. Eng. Chem. *42*, 2576–9 (Dec. 1950). A study was made of the physical properties of the "isomeric octyl" esters of the three isomeric phthalic acids. Isomeric octyl alcohol is made commercially by the Oxo reaction. A selected mixture of seven-carbon olefins is converted to aldehydes with hydrogen and carbon monoxide under high pressures in the presence of a catalyst. The aldehydes are then hydrogenated to alcohols. The isomeric esters made from these alcohols were compounded with a copolymer of 95% vinyl chloride and 5% vinyl acetate. The plasticized resins were evaluated for tensile strength, 100% tensile stress (100% modulus), ultimate elongation, Shore hardness, Tinius Olsen (Tour-Marshall) stiffness, brittle temperature, and volume increase in standard fluids, and the effect of heat and light aging on the physical properties. The plasticized resin containing diisomeric octyl terephthalate has superior heat and light-aging properties and a slightly better brittle temperature than the other two isomeric phthalate-resin compositions.

Applications

PLASTICS IN BUILDING. J. B. Singer. Plastics (London) *15*, 184–6 (July 1950). The use of plastics in building and the design of elements in building construction are discussed briefly.

VINYL PROTECTION FOR SHIPS' HULLS. Brit. Plastics *23*, 68–9 (Aug. 1950). Successful marine coatings for use on ship hulls are based on vinyl resins.

POLYETHYLENE PACKAGING FOR EXPORT CARS. Brit. Plastics *23*, 67 (Aug. 1950). British motor cars are wrapped in polyethylene film as part of the packaging for export shipment.

LAMINATE PANELS FOR BUILDING CONSTRUCTION. Brit. Plastics *23*, 126–9 (Oct. 1950). Phenolic laminate plastic panels with hollow or low density cores are used in building construction in England. Most of the applications described relate to interior partitions, ceilings, and desks.

EXTRUDED PHENOLICS IN REFRIGERATOR CABINETS. Brit. Plastics *23*, 112–14 (Oct. 1950). The extrusion of phenolic plastics is discussed. Applications of extruded parts are described.

TRANSPARENT ACRYLIC MODEL REVEALS BODY'S WORKINGS. Brit. Plastics *23*, 138 (Oct. 1950). An anatomical

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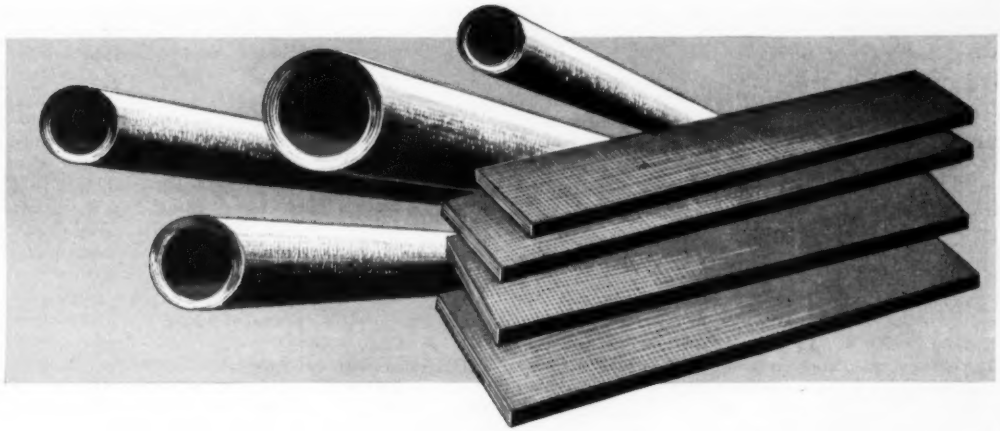

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model of a woman is made of an aluminum skeleton, coated copper veins, arteries, and nerves, and a transparent acrylic plastic body.

RADOME CONSTRUCTION WITH LOW-PRESSURE RESINS. G. May. Plastics (London) *15*, 265–8 (Oct.-Nov.-Dec. 1950). The construction of radomes from thermosetting low-pressure polyester resins is described.

Properties

FACTORS AFFECTING THE CRAZING OF POLYSTYRENE. B. Maxwell and L. F. Rahm. SPE J. *6*, 7–12 (Nov. 1950). The effect of orientation on the critical crazing strain, the reversibility of crazing, and the effect of solvents on the crazing of polystyrene were investigated. It was found that when the polymer chains are lined up in the direction of tensile stressing, the critical strain is increased in direct proportion to the amount of orientation. Reversibility tests were performed on samples allowed to recover for various times at room temperature and also at elevated temperatures. It was found that craze-cracks regain some of their original strength when allowed to recover at or above 82° C. Many representative organic solvents were tested for their effect on the critical crazing strain. These results are tabulated, and the conclusion is drawn that the resulting reduction in critical strain is the result of a plasticizer action by the organic solvents.

THE MECHANICAL EQUATION OF STATE WITH SPECIAL ATTENTION TO THE CREEP OF PLASTICS. W. N. Findley. SPE J. *6*, 13–16 (Dec. 1950). Some of the conditions under which a mechanical equation of state may exist are reviewed and tested in particular for a canvas laminated plastic. In addition an equation is developed which represents the creep behavior of canvas laminate and is in agreement with pertinent theory. From this equation for creep versus time at different stresses an expression is derived for stress versus strain in a tension test at known rates of strain. The agreement between the predictions of this equation and the tension test data at different strain-rate histories lends support to the existence of a mechanical equation of state for this material. However, there are indications that at best the mechanical equation of state may be only approximate.

RHEOLOGICAL PROPERTIES OF PHENOLIC RESINS. EFFECT OF REACTION WITH HEXAMETHYLENETETRAMINE ON PROPERTIES OF A PHENOL-FORMALDEHYDE NOVOLAK. A. J. Guzzetti, G. J. Dienes, and T. Alfrey, Jr. J. Colloid Sci. *5*, 202–17 (June 1950). The rheological properties of phenolic resins of intermediate degrees of crosslinking were studied with a parallel-plate plastometer.

EXTRUSION BEHAVIOR OF VISCOELASTIC MATERIALS. F. D. Dexter and G. J. Dienes. J. Colloid Sci. *5*, 228–38 (June 1950). The relation between viscoelastic properties and extrusion characteristics is discussed. It is shown that materials characterized by non-linear deformation-time properties necessarily exhibit a non-linear relation between volume rate of discharge and pressure in extrusion. Specifically, the presence of delayed elastic elements leads to a relation which shows that, for linear viscoelastic materials, the volume rate of discharge increases more than proportionally with increasing pressure. The important factor to be recognized is time the material spends in the die. This time, on volume average basis, is determined by the material, pressure, and die geometry.

Testing

COMPARATIVE STUDY OF WATER VAPOR PERMEABILITY OF SARAN FILMS. T. W. Sarge. Analytical Chem. *22*, 1541–5 (Dec. 1950). Despite the conspicuous position which saran films occupy in any classification of transparent organic self-supporting uncoated water-vapor barriers, there has been little agreement among investigators concerning the absolute values of water-vapor transmission. This appears to be due chiefly to the diverse methods of attack employed and has resulted in such divergent values as to bring into question the reliability of published data. A comparative study of the methods and data of three different techniques is made: standard cup tests (with modifications) which comprise a constant pressure evaluation; a variable-pressure technique with new results on the modified General Foods gas transmission cell; and a high-vacuum variable-pressure technique. When all the factors that might influence the transmissions are examined, two are found to contribute most to the apparent discrepancies in reported values: the difference in transfer rate due to the vapor-pressure differential as exemplified by the constant-pressure and variable-pressure extremes, and the time factor involved in the determinations. The latter varies from 2 to more than 24 hr., and this variation is extremely significant in view of experimental results. Finally, the removal of volatile constituents from plastic films usually involved in variable-pressure techniques contributes to the apparent discrepancy. Reduction of the data to the same conditions where possible indicates that published results are actually closer together than is apparent merely from transmission values. The final difference is less than $10^{\pm 1}$, which may be considered satisfactory where permeability constants in the extremely low range $P = 10^{-8}$ are involved. The remaining difference must be attributed to the two distinguishing steps in technique: vacuum deplasticization and pressure differential. A graphical analysis of water-vapor transfer data obtained from cup tests indicates that better correlation is made by using "equivalent" transmission than by using short- or long-interval transmission data.

IMPACT RESILIENCE AS A BRITTLENESS TEST FOR POLYVINYL PLASTICS. G. Friedlander. Analytical Chem. *22*, 1545–51. (Dec. 1950). The Lupke impact resilience of plasticized polyvinyl chlorides was studied. The impact resilience temperature curve passes through a minimum which defines the transition from ordinary to rubberlike elasticity. The position of this minimum with regard to temperature is dependent upon the percentage concentration and type of plasticizer used. At temperatures lower than the resilience minimum, i. e., in the absence of rubberlike elasticity, polymer compounds which give rise to high resilience are not capable of large viscous deformation during the short time of impact. In this temperature region impact resilience can be used to classify polymers according to their tendency toward brittleness. Merits of the method are discussed and compared with other brittleness tests.

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U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

PHONOGRAPH RECORD. I. C. Clare (to Hercules). U. S. 2,529,282, Nov. 7. Plastic phonograph record.

ACRYLONITRILE. G. E. Ham (to Monsanto). U. S. 2,529,449, Nov. 7. Acrylonitrile polymer composition suitable for fibers.

FOAM RESINS. J. B. Ott (to Monsanto). U. S. 2,529,512, Nov. 14. Unsaturated alkyd foam resins.

POLYMERIZATION. W. J. Sparks and J. D. Garber (to Standard Oil Development). U. S. 2,529,520, Nov. 14. Low temperature polymerization process for unsaturates using Friedel-Crafts catalysts.

RESINS. H. S. Bloch (to Universal Oil Products). U. S. 2,529,591, Nov. 14. Resins from dichloroalkanes and hydrocarbon fractions containing chloroaromatic hydrocarbons.

ION EXCHANGE. S. H. Frohmader (to Research Products). U. S. 2,529,602, Nov. 14. Formaldehyde-naphthalene sulfonic acid resin.

CONDENSATES. F. J. Olin and P. D. Morton (to Sharples Chemicals) U. S. 2,529,784, Nov. 14. Condensates of urea-monoalkyl urea, formaldehyde, and a monohydric aliphatic alcohol.

COVERING MATERIAL. H. W. Crockett (to Paraffine Cos.). U. S. 2,529,799, Nov. 14. Covering sheet containing vinyl chloride-acetate resin and oil-reactive resin.

CLOSURES. R. H. McClellan (to E. Edelmann and Co.). U. S. 2,529,847, Nov. 14. Apparatus for forming closures from continuous plastic tubing.

ADHESIVE. P. H. Scrutchfield (to American Cyanamid). U. S. 2,529,-851, Nov. 14. Adhesive of starch and ketone-formaldehyde resin.

RESINS. H. J. West and W. T. Watt (to American Cyanamid). U. S. 2,-529,856, Nov. 14. Water-soluble melamine-formaldehyde resins.

TUBING. C. T. Bowen (to Goodrich). U. S. 2,529,863, Nov. 14. Method for making hard thermoplastic tube assemblies.

COPOLYMERS. E. J. Carlson (to Goodrich). U. S. 2,529,866-7, Nov. 14. Copolymers of vinyl benzoate and polyunsaturated carbonate esters and vinyl esters of aliphatic vinyl esters with dialkenyl carbonate esters of alkylene bis-phenols.

TUBING. J. Bailey and C. G. Reber (to Plax). U. S. 2,529,897, Nov. 14. Process for continuous extrusion of thermoplastic tubing.

COPOLYMERS. J. R. Caldwell (to Eastman). U. S. 2,529,911, Nov. 14. Copolymers of acrylonitrile and N-allyl cyanides.

DECORATIVE PLASTIC. N. Hyman. U. S. 2,529,945, Nov. 14. Molded surface ornamentation.

RESINS. J. R. Myles and N. H. Ray (to I.C.I.). U. S. 2,529,956, Nov. 14. Silicon ester resins.

SHEET DRAWING. G. W. Borkland. U. S. 2,530,043, Nov. 14. Method for drawing plastic sheet.

MOLDING. H. H. Holly (to Holly Molding Devices). U. S. 2,530,061-2, Nov. 14. Molding devices.

ADHESIVE. E. C. Van Buskirk, D. D. M. Streed, and J. H. Flood (to U. S. Rubber). U. S. 2,530,099, Nov. 14. Laminate of fibrous material bonded with styrene polyethylene maleate resin and secured to backing material with a styrene-isobutylene adhesive.

PLASTIC SHEET. H. Warp. (to Flex-O-Glass). U. S. 2,530,106, Nov. 14. Reinforced sheet of polyvinylidene chloride monofilaments coated with vinyl chloride-acetate copolymer.

HEAT SEALING. S. E. Bender. U. S. 2,530,221, Nov. 14. Device for heat sealing plastics.

MOLDING. H. A. Kelly, Sr. (to Wheeling Stamping). U. S. 2,530,245, Nov. 14. Plastic molding apparatus.

EXTRUSION. O. G. Nelson (to Western Electric). U. S. 2,530,262, Nov. 14. Extrusion apparatus.

CONTAINERS. E. H. Land (to Polaroid). U. S. 2,530,306, Nov. 14. Manufacture of liquid carrying containers.

RESINS. J. B. Rust and W. B. Canfield (to Montclair Research and Ellis-Foster). U. S. 2,530,315-6, Nov. 14. Modified drying oil-alkyd resins.

BEARING. W. Boyd (to Canadian Patents and Development). U. S. 2,-530,323, Nov. 14. Self-aligning plastic bearing mounting.

THERMOSTABLE COMPOSITION. C. B. Havens (to Dow). U. S. 2,530,353, Nov. 14. Thermostable polyvinylidene chloride compositions.

COAGULATION. E. K. Morris (to Dow). U. S. 2,530,362, Nov. 14. Coagulation of vinylidene chloride polymer latex.

POLYETHYLENE. A. G. Gray (to Du Pont). U. S. 2,530,366, Nov. 21. Electrophoretic deposition of ethylene polymers.

CONTAINERS. L. Rado. U. S. 2,530,-400, Nov. 21. Process for production of containers filled with liquids.

LEATHER SUBSTITUTE. H. A. Reinhardt and W. T. Harrison (to Bigelow-Sanford Carpet). U. S. 2,530,441, Nov. 21. Sheet material of vinyl chloride-acetate resin.

EXTRUSION. W. H. Bonham (to Nixon). U. S. 2,530,503, Nov. 21. Continuous extrusion machine.

CONDENSATE. C. E. Johnson and R. C. Waugh (to Standard Oil). U. S. 2,530,772, Nov. 21. Condensate of phenol and a hydrocarbon complex with a Friedel-Crafts catalyst.

RESIN POWDER. W. F. Bixby (to Goodrich). U. S. 2,530,852, Nov. 21. Production of dry powdery thermoplastic.

VINYL RESINS. J. E. Jansen and J. T. Gregory (to Goodrich). U. S. 2,-530,882, Nov. 21. Vinyl resins plasticized with poly-(carbalkoxyalkylenethio) compounds.

ACRYLONITRILE. W. A. Hare (to Du Pont). U. S. 2,530,962, Nov. 21. Formation of shaped acrylonitrile polymer articles.

COPOLYMER. H. F. Minter (to Westinghouse). U. S. 2,530,983, Nov. 21. Producing a thermoset resin from a

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CONDENSATES. E. Lieber and A. F. Cashman (to Standard Oil Development). U. S. 2,531,063, Nov. 21. Condensates of acyl polymers with aromatic hydrocarbons.

CATALYST. E. L. Kropa and J. J. Padbury (to American Cyanamid). U. S. 2,531,134, Nov. 21. Dimethyl phthalate solution of acetyl peroxide as catalyst for trifluorochloroethylene polymerization.

INSULATORS. M. M. Sprung (to G. E.). U. S. 2,531,169, Nov. 21. Phenol-aldehyde polyvinyl resin composition.

POLYMERS. M. M. Brubaker and R. A. Jacobson (to Du Pont). U. S. 2,531,196-7, Nov. 21. Copolymers of isobutylene and a vinyl ester.

STRIP. D. H. Seckel (to R. A. Fisch). U. S. 2,531,234, Nov. 21. Extruded thermoplastic strip of oriented fibers of two non-compatible plastics.

POLYESTERS. J. L. Jones (to Libbey-Owens-Ford). U. S. 2,531,275, Nov. 21. Polymerizable composition of an unsaturated polyalcohol polyester of an unsaturated acid.

RESINS. I. V. Runyan (to General Aniline). U. S. 2,531,364, Nov. 21. Mixtures of polyvinyl ethers with phenol-acetylene resins.

COATING. D. S. Breslow (to Hercules Powder). U. S. 2,531,392, Nov. 28. Reaction product of toluene triisocyanate and a diisocyanate with a glycol.

RESIN. W. W. Crouch and L. D. Jurrens (to Phillips Petroleum). U. S. 2,531,403, Nov. 28. Coagulating a latex of a sulfur dioxide resin.

RESINS. G. F. D'Alelio (to Industrial Rayon). U. S. 2,531,405-7-8-9-10, Nov. 28. Copolymers of N, N-dimethyl acetamide with vinylidene chloride and of acrylonitrile with N, N-dimethyl acetamide, itaconic acid, and fumaronitrile.

RESINS. D. D. Reynolds and W. O. Kenyon (to Eastman). U. S. 2,531,-468-9, Nov. 28. Methods for preparing polyvinyl sulfonates.

SHEET FORMING. H. E. Smith (to Celanese). U. S. 2,531,539-40, Nov. 28. Process for shaping plastic sheet.

EXPANDED RESINS. S. Booth (to Ex-

(*Continued on p. 113*)

Bright Colors spur Plastics Sales

Utility and durability in plastics are now being taken for granted. New, gay colors are the focal point of many merchandising programs.

CALCO's complete line of dyes and pigments, both organic and inorganic, is standardized to meet the particular needs of processors and users of plastics products.

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Beryllium Copper Cores and Cavities

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HOW ABOUT YOUR NEXT JOB? If you want to assure yourself trouble-free molding, low cost, unlimited cavities from your hob, high fidelity, call your PROCESS MOLD representative *now* for details.

(Toy designed by John P. Gowland, Fiesta Toys, Santa Barbara, Calif.; hob by Jan & Ballard, Pico, Calif., and Mojave Die & Engraving, Los Angeles; molded by Armor Plastics, Culver City, Calif.; distribution by Precision Specialties, Los Angeles.)

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Atlanta 3, Georgia

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Let our engineering staff solve your fastener problems.

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Accepted by the Trade Since 1922

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91 Mechanic Street • Leominster, Mass.

panded Rubber). U. S. 2,531,665, Nov. 28. Manufacture of expanded thermoplastic resins.

STRIPS. C. D. Orsini (to Nixon). U. S. 2,531,739, Nov. 28. Process for forming plasticized thermoplastic strips.

PHENOLIC RESINS. M. J. Scott and E. F. Jackson (to Monsanto). U. S. 2,531,863, Nov. 28. Reacting phenol-aldehyde resin with a nitro-paraffin and reducing to the amine.

MOLDING. M. E. Nye and H. E. Nye (to Nye Rubber). U. S. 2,531,888, Nov. 28 Device for plastic molding.

ADHESIVE TAPES. C. A. Dahlquist, J. O. Hendricks, and W. E. Sohl. (to Minnesota Mining). U. S. 2,532,011, Nov. 28. Liners and adhesive tapes having low adhesion polyvinyl carbamate coatings.

RESINS. D. E. Floyd (to General Mills). U. S. 2,532,018, Nov. 28. Polyvinyl resins plasticized with a triester.

TUBING. S. J. Everett. U. S. 2,532,-091, Nov. 28. Apparatus for forming thermoplastic tubing.

CONDENSATES. A. L. Rummelsburg (to Hercules). U. S. 2,532,120, Nov. 28. Condensates of rosin with unsaturated carboxylic compounds.

FLOOR COVERING. W. Rowe (to Bonafide Mills). U. S. 2,532,196-7, Nov. 28. Thermoplastic drying oil polyolefin composition.

VINYL RESIN. W. H. Bromley, Jr. (to Shawinigan). U. S. 2,532,223, Nov. 28. Preparation of stable vinyl resin emulsions.

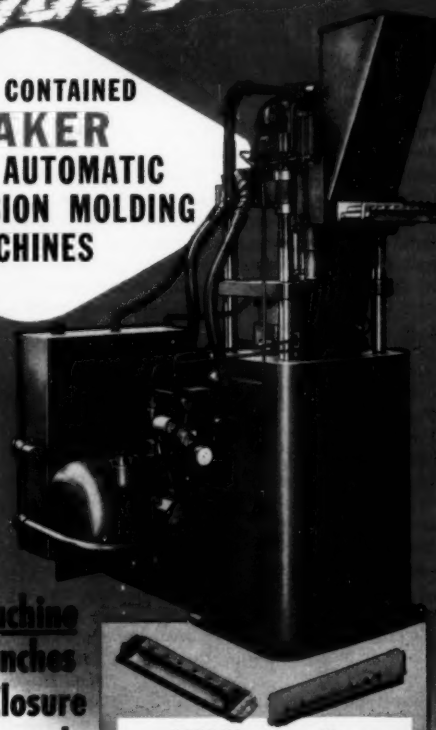
FOAMS. J. B. Ott (to Monsanto). U. S. 2,532,240-1-2-3, Nov. 28. Producing foams from unsaturated alkyd, polyvinyl acetal, polystyrene, or polyethylene resins.

Plating Strength

In the article, "The Work Horse Sets New Records," MODERN PLASTICS, February 1951, the statement was made on page 60 that the bond strength between nickel plating and a new conductive phenolic developed by Durez Plastics & Chemicals, Inc., is over 200 p.s.i. This should have read "over 2000 p.s.i."

Production

SELF CONTAINED
BAKER
FULLY AUTOMATIC
COMPRESSION MOLDING
MACHINES



The one machine with 400 inches per minute Closure for ALKYD and slow speed for Phenolics, Ureas Melamines

1680 Pieces per Hour

One Baker Press with an 8-cavity die, 13 second cure, and 4 second machine cycle time, turns out these television tuner boards at the rate of 1680 pieces per hour. Accurate automatic metering has reduced material consumption 15-20% under that previously experienced with semi-automatic operation. Further, the resulting lower flash and use of Alkyd has markedly increased die life. Previously dies had shown wear after 100,000-120,000 cycles. At present, after 300,000 cycles, there is no sign of die wear.

Baker Brothers invite comparison of their closure speed of 400 inches per minute, their large platen area and overall cycle time of 4 seconds plus cure with any other machine for Alkyd materials now on the market. Actual records of specific parts show the machine to be capable of multiplying production by as much as four times with lower initial investment due to the fewer die cavities required . . . and at correspondingly lower daily production cost. The machine is available from stock in both 15 ton and 30 ton models with 8 cavity feeder. Floor area: 56" x 25" for either model. Send for details . . . now!

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PROGRESS IN HEAVY MACHINERY . . SINCE 1867

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TOLEDO, OHIO
Send more information on the Baker Fully Automatic Compression Molding machine to:

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NEW MACHINERY AND EQUIPMENT

REMOTE CONTROL—Sterling Electric Motors, Inc., 5401 Anaheim-Telegraph Rd., Los Angeles 22, Calif., has developed an improved mechanical remote control for its Speed-Trol (Variable Speed) electric power drives. The control is provided in several types with the following accessories, either individually or in combination: extended flexible cable; extended rod with universal joint; right-angle bevel gear with extended rod; and chain and sprocket.

A remotely located speed indicator with handwheel is also available with these features. The handwheel control is always at the operator's fingertips, permitting greater usage of the variable speeds provided by the Speed-Trol motor and allowing for a steady flow of power at any selected speed even under fluctuating load conditions. Sterling speed drives come in ½- to 25-hp. sizes.

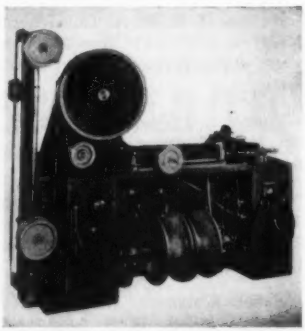
INJECTION MACHINE—Two-part design, comprising a mold clamp and an injection unit which are individual and separate units, is claimed to be the key to the versatility of the new H-P-M Model 60-A plastics injection molding machine introduced by The Hydraulic Press Mfg. Co., 1012 Marion Rd., Mt. Gilead, Ohio. Designed for today's production with the assurance that it will handle the larger capacities of the future, this 60-oz. machine can be converted to 200-oz. capacity by installing the H-P-M 200-oz. preplasticizing conversion unit. The original all-hydraulic mold clamp and power unit are still utilized after conversion.

Among the features claimed for this new equipment are: greater injection speed; increased plasticizing capacity; mounting of all hydraulic components outside the base for easy accessibility; 1000-ton mold clamp; 36-in. maximum clamp stroke; 60- by 40-in. platens; and a 60-in. daylight opening for big molds.

FORK TRUCK—Redesign of its Pul-Pac fork truck, resulting in a device that handles unit loads without use of conventional pallets, has been announced by Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich. The principal change in the Pul-Pac design is the adoption of a pantograph-type linkage to actuate the gripper-jaw and pusher rack, in place of the long piston rods employed on previous models. The new construction allows a shorter hydraulic stroke from a more powerful piston, and eliminates the severe bending stresses to which long pistons were subjected. The new unit, which can operate in less space than former models, has a detachable mounting and is interchangeable with standard forks up to 54-in. usable length.

EXTRUSION TAKE-UP—A high-speed constant-tension dual-reel continuous extrusion take-up has been developed by Industrial Ovens, Inc., 13825 Triskett Rd., Cleveland 11, Ohio. It is designed for use in the production of plastic- or rubber-coated wire, cord, or cable, and is supplied with or without an integral capstan and tension stand.

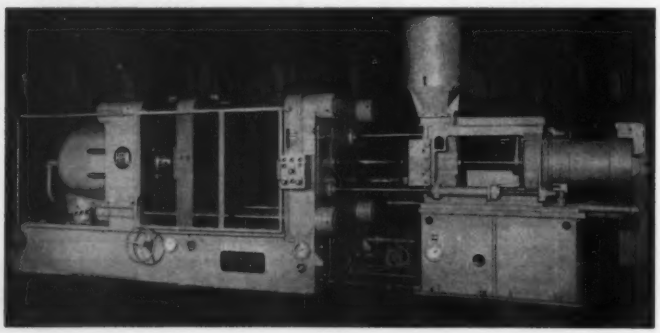
Speed range is from 0 to more than 2600 ft. per minute, with instantaneous acceleration of the empty reel to synchronize with wire speed as soon as cross-over is made. No interruption or slow-down in the winding process is necessary to shift from full to empty reel. All drives are hydraulic and are completely self-contained. A special reel-mounting arrangement permits loaded reels to be deposited gently on the floor on the reel flanges to minimize reel damage and distortion.



PYROMETERS—Calibrated accuracy to within 0.75% is claimed for a line of new pyrometers introduced by the Meter and Instrument Divisions, General Electric Co., Schenectady 5, N.Y. The complete line consists of flush- or surface-mounted indicators, controllers, and protectors, and includes four main types designated HP-1, 2, 3, and 4. The instruments offer accurate temperature indication, close temperature control, and protection in such industrial applications as heat-treating and melting furnaces; plastics molding machines;

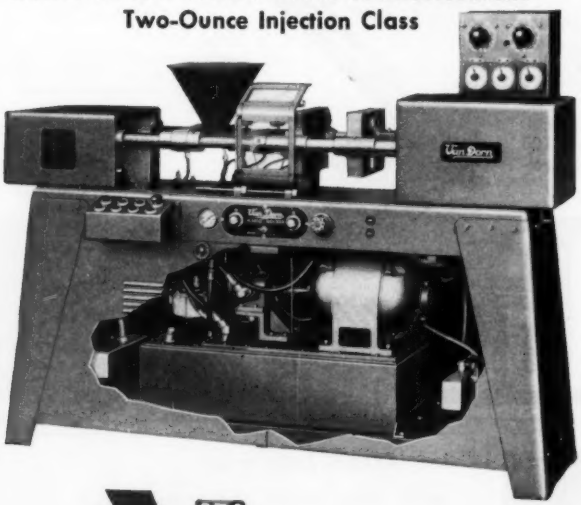
(*Continued on p. 117*)

New 60-oz. injection machine with two-part design is convertible to 200-oz. capacity

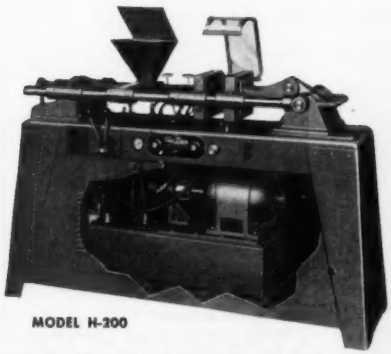


Produce Plastics Profitably With This
VAN DORN Equipment

Model H-200—Leader in the Semi-Automatic Two-Ounce Injection Class



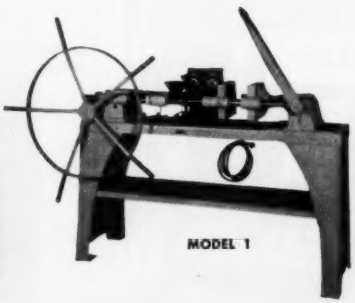
This ultra-modern press molds practically all thermoplastics including nylon. It completes up to 6 operating cycles per minute. Push button controls are safe, simple and convenient. Compact and rugged, the unit is quiet and economical in operation. Sliding gate with interlocking safety devices starts the cycle. Solenoid valves close the molds. Injection and dwell are controlled by first of three timers on the rear panel. Center timer regulates recharging of heater. The third timer controls the length of the mold close cycle; when time runs out, molds automatically open and parts are ejected. Operator opens safety gate, removes product and then closes gate to begin the next cycle . . . Variable voltage transformers in conjunction with thermostatic units control the temperatures on the two heating zones accurately.



MODEL H-200

Power Operated, Lever Controlled Presses

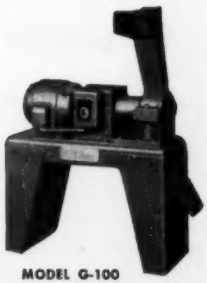
2-oz. or 1-oz. capacity. These low-cost units operate 8 hours for under a dollar and use inexpensive molds. Can easily be set up in twenty minutes by one man.



MODEL 1

Manually Operated Press

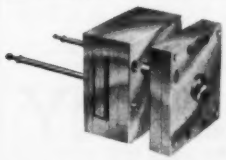
1-oz. capacity. This press is ideal for smaller jobs, experimental work and technical training.



MODEL G-100

Plastic Grinder

Grinds up rejects, waste, etc., for re-use. Ruggedly made, designed for easy cleaning.



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Available from stock for all Van Dorn presses.

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Spring and Non-Spring
for
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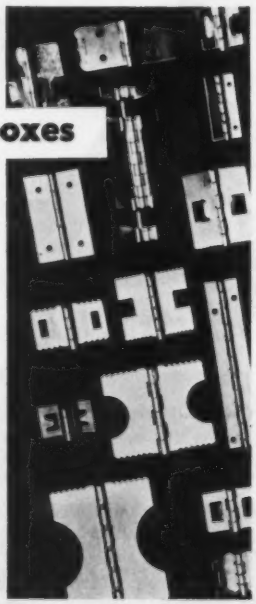
Send samples, prints or sketches for quotation.



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HINGES

Let ATLAS help you with your high pressure reducing problems

Regulation problems have been our specialty for more than a half century. Therefore we should be able to help you out of your high pressure reducing troubles. Usually, in plastics plants, we recommend the

ATLAS Type "E"

High Pressure Reducing Valve

shown at the left. It is now being used in the foremost plastics plants of the world, thanks to its excellent performance. It reduces pressures as high as 6,000 lb. per sq. in.—**without shock**—regardless of whether it is water, air, or oil.

Every Detail is Right.

Obviously, to reduce a pressure of 6,000 lb. per sq. in. without shock every detail MUST be right. The body, for instance, is of the strongest forged steel. Parts subject to severe abrasion and corrosion are Stellited. In fact all internal metal parts are specially protected. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure.

Ask for complete data on Type "E." We will be glad to send it by return mail.

For other ATLAS plastics plant products see the partial list in our ad in the January 1951 issue of MODERN PLASTICS

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

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Represented in Principal Cities

and brick, cement or ceramic kilns.

A legible 7-in. scale indicates any change in temperature equal to 0.1% of full scale. The heart of the indicating instrument is a 3¼-lb. magnet; the indicating device is a millivoltmeter connected to a thermocouple on the furnace or other heating equipment.

PREHEATER—Low operating cost is a principal feature of the new Model 50 Thermall plastics and rubber preheater designed by W. T. LaRose & Associates, Troy, N.Y. This economical operation is made possible by improved power and rectifier tubes, transformers, and case design. Model 50 is rated as a "very high frequency" electronic preheater suitable for handling 5 lb. of compound a minute. It is dual purpose

in that it will heat a bulk load of compound or will accomodate a load of compound on a loading-board, generally used in connection with multi-cavity mold jobs.

LABEL ACTIVATOR—Delayed-tack thermoplastic labels—enjoying increased popularity for plastics, metal, fabric, and glass packages and other containers to whose surface it is difficult to adhere labels—can be activated by a new device produced by Potdevin Machine Co., 1285 38th St., Brooklyn, N.Y. The activator provides efficient labelling for both short- and long-run production setups. It activates precoated labels quickly and evenly, and delivers them in any quantity.

Correct heat is maintained by a thermostatic control. The activator, in a heavy metal housing, comes in two sizes—6- and 12-in. widths—for 100-v., 60-cycle, AC circuits.

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Here is the most versatile machine for any plant. . . . So simple to operate by unskilled labor.

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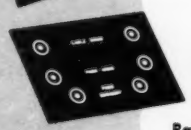

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This heavy duty bench type model covers a larger engraving area than any other machine of its kind.

Name Plates

PORTABLE ENGRAVER
described in Folder 1M20
HEAVY DUTY ENGRAVER
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World's Largest Manufacturer of Portable Engraving Machines

BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Technical Publications, 1948," edited by Arman E. Becker.

Published by Standard Oil Development Co., 15 W. 51st St., New York 19, N. Y. 512 pages

The content of this volume comprises a selected group of papers, chosen from over 100 written by the company's technologists, which were published in scientific journals in 1948. Geology and production; manufacturing and fuel quality; rubber and plastics; and analysis are the general fields to which the reprints apply. The book, which is not for general sale, is available for reference purposes at educational institutions, public libraries, and industrial research laboratories in this country and abroad.

"Kunstleder-Handbuch" by Walter M. Munzinger.

Published by Wilhelm Pansegran Verlag, Berlin-Wilmersdorf, Germany. 327 Pages. Price DM 30.

This second edition of the artificial leather handbook originally published in 1940 has been completely revised and its scope enlarged. The raw materials and processes used in the manufacture of leatherlike products are discussed in detail. The properties, uses, and testing of such products are reviewed. The names and properties of the German film-forming materials, solvents, and plasticizers used in artificial leather manufacture are presented in eleven tables.

"Polyvinylalkohole" by Franz Kainer.

Published by Ferdinand Enke Verlag, Stuttgart, Germany. 321 pages. Price DM 29.60.

This monograph is essentially a review of the patent literature relating to polyvinyl alcohol. It includes references to methods of preparation, reactions with other compounds to form derivatives, and applications. The latter cover many diverse fields, such as paper, films, textiles, rubber, leather, plastics, protective coatings, adhesives, chemical, medical and cosmetics. A chapter on the chemical composition, structure, and properties of polyvinyl alcohol summarizes information published in the scientific literature on these phases of the subject. This book is a valuable reference work for anyone concerned with the technology of polyvinyl alcohol.

"Chemical Engineering Cost Estimation" by Robert S. Aries and Robert D. Newton.

Published by Chemonomics, Inc., 400 Madison Ave., New York 17, N. Y. 109 Pages. Price $5.00

Quick estimating of equipment costs by graphical methods for all pieces of major equipment, piping insulation, and other auxiliaries is the main theme of this handbook, designed for chemical engineers and industrial chemists in the chemical process industries.

"Colloidal Dispersions" by Earl K. Fischer.

Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $7.50

A study of the dispersion of finely divided solids in liquid media, this book covers the theory and practice of this chemical process, essential in the manufacture of paint, printing ink, pigments, textiles, ceramics, rubber, and other industrial products.

In addition to including several topics previously neglected in colloidal literature, such as dispersion by non-aqueous liquids and dispersion by phase transfer (the flushing process), the author provides a detailed account of the practical uses of wetting agents, the operation of mixing and dispersion equipment in mills, and a critical discussion on particle size.

Vinyl data folders—Two reference manuals for plastics molders, extruders, laminators, and fabricators are now available from this company. The first, "Evaluation of Stabilizers for Vinyl Stocks containing Chlorowax 40," reports the results of a laboratory study of two standard stabilizer formulations, with light and heat stability of each concisely summarized. The second, "Evaluation of Inert Fillers in Vinyl Plastics," details how company-formulated precipitated calcium carbonates, made in eight different grades, meet the vinyl plastic compounder's basic requirements of cost, purity, color, processability, light stability, plasticizer absorption, uniformity, and physical structure. *Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio.*

Container coatings bibliography—Abstracts of some 150 patents and research papers on food and other container coatings, published since 1941. Author, inventor, and patent indexes are included. Designated PB 100 864, it is available at $1.25 from the *Army Quartermaster Technical Library, Philadelphia, Pa.*

Grinding and mixing equipment, Bull. 265—The firm's complete line of grinding and mixing equipment is illustrated and described in this 18-page bulletin. Special attention is given to Borundum grinding media which are said to increase grinding capacity of mills 60% or more. Toughness and wear-resistance of the new medium are claimed to lessen contamination of the mill charge. *The U. S. Stoneware Co., Process Equipment Div., Akron 9, Ohio.*

Industrial rust prevention—Directions relate to the following: uses under general exposure and other special conditions which produce rust; machinery and implement finishes; heat-resistant and chemical-resistant coatings; floor coatings; and over 30 different kinds of service and application. An important addition to this new catalog is the showing of 70 color chips. Specification descriptions indicate resistant qualities, drying time, thinner requirements, and methods of application. *Rust-Oleum Corp., Evanston, Ill.*

Moisture and fungus resistant coatings—Manufacturers of electronic and associated electrical equipment will be interested in this service manual designed to provide them with technical data and specification information on moisture and fungus treatment. The booklet is comprised of technical data sheets on the firm's

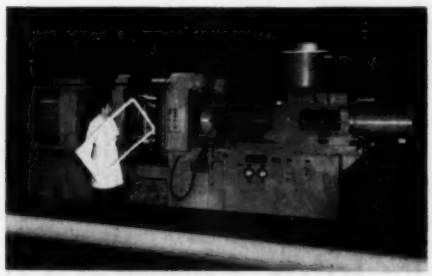
(*Continued on p.* 121)

IF IT'S A MOLDED PRODUCT

– it's our baby!

Whether you are using the part in a baby's rattle or in a jet plane— Continental can give you a custom-molded part you can rely on.

Letter-perfect is the only yardstick used at Continental. No matter what your specifications call for, we have the best in compression, transfer and injection molding equipment and technical skill to meet them. And, equally important to you, Continental's modern plastics plant has the capacity to assure a dependable source of supply.



One of Continental's 60-ounce injection molding machines produces one-piece retainers for refrigerator inner doors — a real achievement! They're 2½ feet wide and almost 4½ feet long.

CONTINENTAL CAN COMPANY

Plastics Division

CAMBRIDGE, OHIO

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various products, complete with specification requirements, along with explanatory bulletins covering safety precautions to be observed with fungicide coatings, specific gravity determinations, methods of application, and factors affecting the drying time of surface coatings. *Brooklyn Varnish Mfg. Co., 50 Jay St., Brooklyn 1, N. Y.*

Dispersions—Detailed data on the characteristics of Kel-F are contained in this two-page folder, which declares that Kel-F dispersions may be applied by spraying, dipping, or brushing. Means for applying these dispersions, properties of the first two of a series, and suggested fusion operations are included. The company has also revised its Technical Bulletins No. 2 and 3 which include data on the modification of Kel-F properties resulting from heat treatment and molding techniques. *The M. W. Kellogg Co., P. O. Box 469, Jersey City, N. J.*

Physical properties of synthetic organic chemicals—The 1951 edition of this 16-page booklet is a condensed guide for users of organic chemicals. It presents data on application and physical properties of more than 250 synthetic organic chemicals. *Union Carbide and Carbon Corp., Carbide and Chemicals Div., 30 E. 42nd St., New York 17, N. Y.*

Fully automatic molding of thermosetting plastics—The origins and growth of automatic molding from the hand mold press to the fully automatic press are described in this 24-page brochure. Fully automatic molding has these advantages: uniformity of parts, low mold cost, low labor cost, less molding time, material savings, minimum investment, and controlled inventory. Typical applications for such molding are illustrated, together with an appraisal of its adaptability to a wide range of plastics products. Several case histories of successful automatic molding are presented. *F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa.*

Hand and foot valves (Bull. 303)—The company's ¼-in. and ⅜-in. 880 series hand and foot valves are described in this four-page folder. Installation data, engineering drawings, and explanations of inter-

how long would it take YOU to deflash these parts?
1000 parts DEFLASHED
in 6 min.
1000 parts DEFLASHED
in 8 min.
500 parts DEFLASHED
in 7 min.
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$100,000 in labor costs the first year by eliminating more than 95% of all hand finishing at the Minneapolis Honeywell Regulator Co.

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WHEELABRATOR & EQUIPMENT CORP.
816 S. Byrkit St., Mishawaka, Indiana

changeability of parts and ease of modification are included on this series, which was developed for quick control of small cylinders and for pilot operation of master valves. *Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich.*

Aids in obtaining military business—Two guides designed to assist industry in its business relations with the government have just been released. "Selling to the Armed Forces," a 34-page directory, gives an alphabetical listing of major articles being bought by military services and the offices that buy them. It also provides a geographical guide to major purchasing offices in the country. The companion publication, "How to Get Military Business," explains procedure to be followed in establishing and maintaining contact with buying offices; negotiating, renegotiating, and financing contracts; obtaining subcontracts; selling services; obtaining security clearance; and qualifying for a 60-month amortization. *Research Institute of America, 292 Madison Ave., New York 17, N. Y.*

Plastic wall plaque—How tungsten carbide metal is made is described in a chart which has been produced in the form of a plastic wall plaque. The chart, which is laminated to a transparent plastic cover sheet, measures 9 by 12 in., and is suitable for hanging on a wall or standing on a desk. It presents the complete steps in the preparation of the producer's Talide tungsten carbide metal by either the hot press or cold press (or sintering) methods. *Metal Carbides Corp., 107 E. Indianola Ave., Youngstown 5, Ohio.*

Conical blender—Installation photographs and information on the application of the company's conical blender to dry blending operations are covered in this 12-page booklet. Discussed is the efficiency of these units for the rapid blending and mixing of dry powders, colors, pigments, and synthetic products, including fine and heavy chemicals, dyes and intermediates, resins, molding powders, plastics, and so forth, as well as for the blending of powdered metals and binders with metals and all kinds of free-flowing dry materials. Services offered by the Research Dept. are also outlined. *The Patterson Foundry & Machine Co., East Liverpool, Ohio.*

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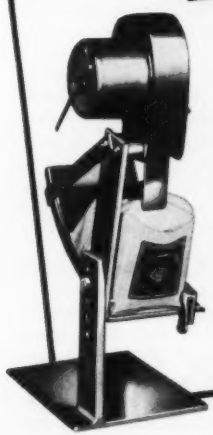

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INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

Plastics Salon in Turin—The Executive Committee of the Western Trade Fair has decided to organize the third International Plastics Salon, to be held in Turin in the fall of 1951. The exhibition will consist of sections on plastics in domestic appliances, in various industries, and in packaging, as well as sections on varnishes and bonds, and on machinery for processing plastics. Applications for exhibit space are now being accepted by the Organizing Committee.

The third International Congress on Plastics will also be held at the same time as the International Plastics Salon.

Polyethylene pipe installation—The largest agricultural water supply system yet to be laid using Alkathene pipe, manufactured by the Plastics Div., Imperial Chemical Industry Ltd., is being installed on the Hoon-Hatton Estate, the property of the Derbyshire County Council. This is the first major scheme of development of small holdings under Part IV of the Agriculture Act of 1947. This part of the Act, which came into force in October 1949, is primarily intended to enable farm workers to become tenant farmers of highly equipped small holdings.

The Hoon-Hatton Estate lies about 10 miles due west of Derby amid some of the finest cattle grazing lands in the country. The holdings are between 38 and 50 acres in extent and will be supplied with water from a storage tank, which in turn is fed by a mains supply. There are 5880 ft. of pipe connecting the main to the reservoir, and some 21,000 ft. of distribution and branch-lines feeding troughs as well as farm buildings.

It is intended to pull in the whole length by mole-plow, even where it crosses a shallow stream. This is, of course, quite the speediest and most efficient method of laying long lengths of pipe, and one for which Alkathene tube is eminently suited because of its flexibility and lightness. Each 500-ft. coil can be laid in about 5 min. without stopping the mole-plow. The long lengths in which the tube can be supplied also cut the number of joints needed.

The soil at Hatton is slightly acidic, but Alkathene tube is completely resistant to corrosive soils and water. Polyethylene is also completely resistant to frost conditions, so no bursts due to freezing can occur where the pipe is above ground.

British Plastics Exhibition—More than 60 firms have arranged to show their products at the British Plastics Exhibition, to be held in London, June 6 to 16, 1951. The first floor of the National Hall, Olympia, will be given over to an exhibit, "The Story of Plastics," sponsored jointly by the British Plastics Federation and the Council of Industrial Design. A concurrent Convention will consist of 15 sessions with scientific and technical papers being given during the mornings and papers on more general subjects in the afternoons. The public will be admitted to the afternoon sessions.

Open House—T. H. & J. Daniels, Ltd., Stroud, Glos., England, will have "open house" for overseas visitors during the Festival of Britain. Guides are being trained to show visitors around the company's plant, which includes an installation of plastics molding equipment.

Plastics at B.I.F.—The full range of British plastics will be featured at the 1951 British Industries Fair to be held in London and Birmingham April 30 to May 11, 1951. The plastics section will be located at Earls Court (London) exhibition hall. The exhibits will include fabrications and extrusions, casein, new insulating materials, cushioning materials for packaging, "high style" plastics jewelry, special emulsion for use in paints, new embossed p.v.c. sheeting, and many other items.

* Reg. U. S. Pat. Office

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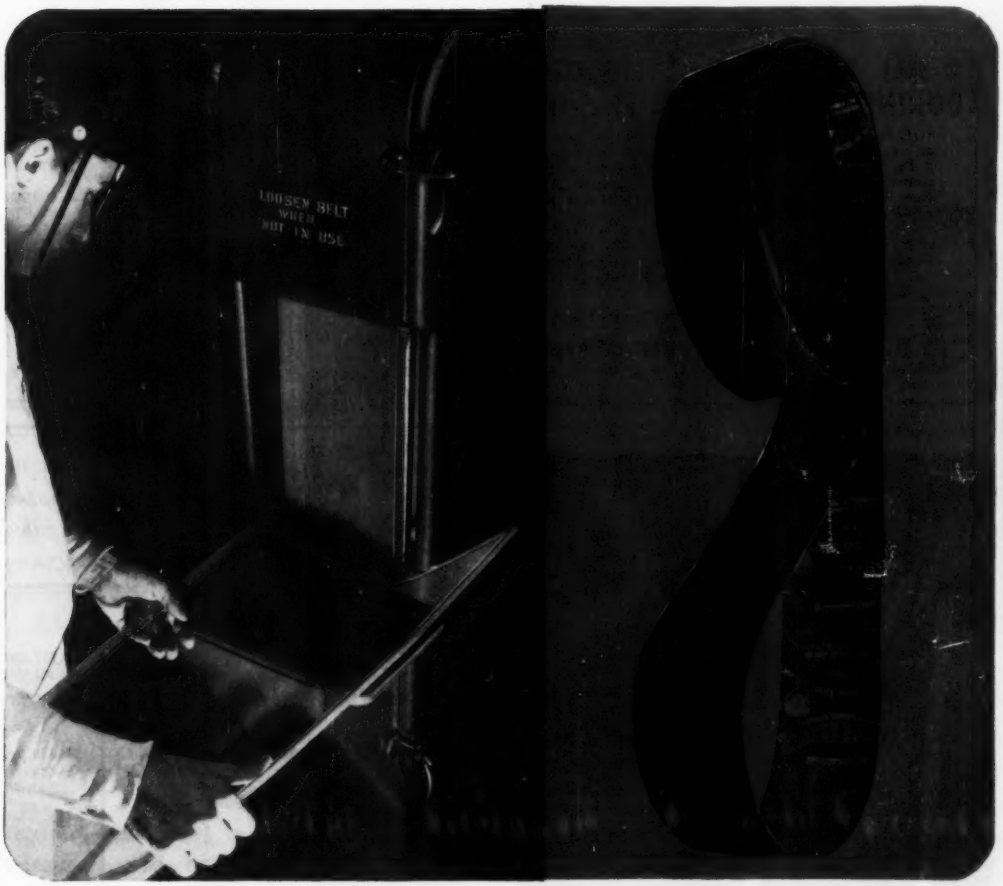
Because Waterproof Cloth Belts by CARBORUNDUM are specially designed for wet sanding of plastics they produce *more and better work pieces* at lower unit cost. High rate of cut maintained throughout lengthy belt life; "down-time" minimized through superior resistance to wet-stretch. Better operating conditions assured with splice-throb eliminated and plastic dust "wet down" when lubricants are used. See your CARBORUNDUM representative about these and other working advantages of Waterproof Cloth Belts by CARBORUNDUM.



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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant, for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled

Materials	*Total prod'n. first 11 mos. 1950*	*Total sales first 11 mos. 1950*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, continuous:		
Under 0.003 gage	11,076,748	11,068,082
0.003 gage and over	9,756,982	10,007,214
All other sheets, rods, and tubes	4,190,641	3,788,016
Molding, extrusion materials	74,829,308	72,951,099
Nitrocellulose:		
Sheets	5,759,082	5,862,908
Rods and tubes	1,468,682	1,075,475
Other cellulose plastics[b]	11,319,752	11,779,293
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	66,031,417	45,872,073
Adhesives	27,129,011	25,065,633
Molding materials[a]	200,038,021	174,692,497
Protective coatings (containing less than 10% modifier)	20,795,948	16,721,046
Miscellaneous uses (including casting)	60,044,753	57,698,502
UREA AND MELAMINE RESINS		
Adhesives	71,103,429	68,440,410
Textile- and paper-treating resins	27,225,284	22,520,983
Protective coatings, modified and unmodified	27,034,662	23,361,810
Miscellaneous uses, including laminating and molding[c]	62,860,075	62,184,879
STYRENE AND STYRENE DERIVATIVE POLYMER AND COPOLYMER RESINS:		
Molding materials[a]	238,402,762	248,311,426
Miscellaneous uses[d]	108,076,428	42,941,450
VINYL RESINS:		
Sheeting and film, including safety-glass sheeting[a]	204,114,052	194,649,368
Adhesive (resin content)	15,952,477	14,684,138
Textile- and paper-treating resins, including spreader and calendering types (resin content)[e]	41,859,822	41,716,364
Molding and extrusion material (resin content)	103,058,791	102,019,264
Miscellaneous uses (resin content)[e]	20,574,193	13,068,105
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a, f]	55,309,540	54,683,349
Protective coatings[g]	67,429,258	67,309,563
All other uses[h]	122,415,683	188,810,832

[a] Includes fillers, plasticisers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Excludes data on protective coating resins; these data are included with miscellaneous coating resins to avoid disclosure of

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

IN POUNDS FOR OCTOBER AND NOVEMBER, 1950 by U. S. Tariff Commission

October 1950		*November 1950*	
Production	*Sales*	*Production*	*Sales*
1,158,409	1,210,802	1,150,286	1,070,082
1,167,886	1,274,929	1,108,878	1,138,593
504,523	495,418	399,559	401,654
8,642,684	8,457,410	6,695,726	6,496,440
584,696	614,977	587,526	604,029
126,493	120,895	118,107	91,122
1,329,472	1,461,920	1,069,275	967,882
7,348,530	5,615,904	7,332,853	5,269,510
2,828,325[1]	2,635,466[1]	2,344,435	2,601,728
19,828,118	18,866,128	18,801,781	16,637,305
2,661,361[1]	2,127,362[1]	1,787,166	1,483,278
6,361,663[1]	5,831,853[1]	6,049,826	6,306,905
7,714,369	6,967,087	7,299,087	7,305,773
2,703,807	2,370,674	3,870,277	3,767,618
2,816,791	2,273,205	2,581,153	2,271,075
6,240,096	7,514,826	6,432,738	6,687,577
24,324,689	25,457,751	25,798,312	24,626,838
5,333,128	4,457,788	4,312,084	4,006,524
21,622,481	20,208,345	16,682,878	16,410,143
1,250,222	1,162,720	955,124	942,378
4,211,734	4,081,799	4,214,627	4,430,951
9,926,629	10,490,519	9,981,227	10,375,404
2,024,612	1,424,960	1,897,073	1,205,257
6,196,471	6,432,788	5,667,009	5,591,052
7,609,208	7,704,660	7,894,682	7,434,482
20,610,877	20,626,239	19,222,618	18,817,394

operations of individual companies. [a] Includes data for spreader and calendering-type resins. [f] Includes data for acrylic, polyethylene, nylon, and others. [g] Includes data for coumarone-indene, petroleum, silicone, and other protective coating resins. [h] Includes data for acrylic, alkyd, coumarone-indene, nylon, petroleum, silicone, and others for miscellaneous uses. [1] Revised.

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The 2 and 3-Dimensional

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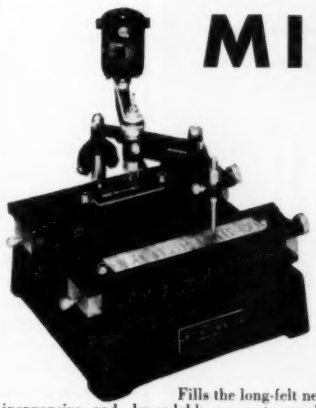

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Note These Superior Features

- Engraves 2 or 3 dimensions.
- Pantograph permits 4 reduction ratios.
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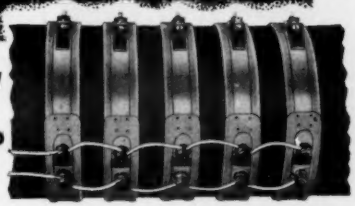

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S. P. I. Reinforced Plastics Session

THE following program has been set up for the Sixth Annual Technical Session and Exhibit of the S.P.I. Reinforced Plastics Div., to run from Feb. 28 through March 2 at the Edgewater Beach Hotel, Chicago, Ill.:

Wednesday morning session—Harold Freeman, American Cyanamid Co., presiding; Billy B. Curl, U. S. Air Force, recording secretary.

"S.P.I. Reinforced Standards Report," Arthur L. Smith, Continental Can Co., Inc.

"The Variables in Molding Fiberglas Preforms," Milton Brucker, president, Zenith Plastics Co.

"Basic Mold Design," Arthur J. Wiltshire, Engineering Dept., Apex Electrical Mfg. Co.

"Bulk Fillers," A. W. Levenhagen, Molded Resin Fiber Co.

Wednesday luncheon—Clare E. Bacon, Owens-Corning Fiberglas Corp., presiding; Charles E. Hoover, same firm, recording secretary.

"Merits of the Reinforced Fiberglas Bread Tray," Oscar E. H. Froelich, Ward Baking Co.

"So You Have Started a Reinforced Plastics Business," J. S. Finger, president, Corrulux Corp.

Thursday morning—Government forum. Moderator: Dr. R. W. Ehlers, Office of the Quartermaster General. John A. Owen, Sorg Paper Co., recording secretary.

"The Design and Development of Reinforced Plastics Quartermaster Items," A. C. Weiss, Office of the Quartermaster General.

"Reinforced Plastics in Naval Aircraft," Robert Temple, Dept. of the Navy, Bureau of Aeronautics.

"Bureau of Ships Activities in Reinforced Plastics," John B. Alfers, Dept. of the Navy, Bureau of Ships.

"Reinforced Plastics in Army Engineer Research and Development," Lt. Col. Kenneth J. Cramsic, Engineer Research and Development Labs.

"Reinforced Plastics in Aircraft Applications," R. T. Schwartz, Air Material Command.

"Glass Fiber Polyester Laminates Having High Resistance to Moisture," Luther L. Yaeger, Bjorksten Research Labs., Inc.

Thursday luncheon—"New Developments in the Field of Resins." Moderator: Ralph David, *Plastics Industry* magazine. Lawrence Wittman, Consultant, recording secretary.

The following will sit on this panel: D. G. Patterson, American Cyanamid Co.; G. D. Jefferson, Atlas Powder Co.; Frank I. Bennett, Bakelite Div.; Dr. J. A. Loritsch, General Electric Co.; Samuel A. Moore, Interchemical Corp.; Dr. Irving Muskat, Marco Chemicals, Inc.; Thomas A. DeMarco and Charles L. Mills, Monsanto Chemical Co.; P. M. Elliott, Naugatuck Chemical Div.; Dr. Eugene W. Moffett, Pittsburgh Plate Glass Co.; Harry Kline, Reichhold Chemicals, Inc.; William E. Wirsch, The Resinous Products Div., Rohn & Haas Co.

Thursday evening—Annual Banquet. Leonard S. Meyer, Western Products, Inc., toastmaster. Speaker: C. G. Frantz, Apex Electrical Mfg. Co., "Horizons in Appliances."

Friday morning session—Robert J. Brinkema, R. J. Brinkema Co., presiding. Samuel S. Oleesky, recording secretary.

"Current Situation on Raw Materials," William T. Cruse, executive vice president, S.P.I.

The panel at the Friday morning technical forum will include: William R. Bradley, American Cyanamid Co.; Dr. J. D. Robinson, American Cyanamid Co.; Arthur J. Wiltshire, Apex Electrical Mfg. Co.; Frank I. Bennett, Bakelite Div.; Norman E. Wahl; Roger B. White, Laminated Plastics, Inc.; Robert S. Morrison, Molded Resin Fiber Co.; Dr. R. W. Ehlers, Office of the Quartermaster General; Clare E. Bacon, Owens-Corning Fiberglas Corp.; Eric A. Brown, Polyfiber Ltd.; Milton Brucker, Zenith Plastics Co.

Friday luncheon—James S. Lunn, Lunn Laminates, Inc., presiding. W. E. Wirsch, The Resinous Products Div., recording secretary.

"Machining and Finishing of Reinforced Plastics Parts," Roger B. White, Laminated Plastics, Inc.

"Industrial Hygiene Considerations in the Manufacture of Reinforced Plastics," William R. Bradley, American Cyanamid Co.

"Design and Fabrication of Glass Reinforced Helicopter Main Rotor Blades," Norman E. Wahl, Cornell Aeronautical Laboratory, Inc.

"A Survey of the Reinforced Plastics Industry in Canada," Eric A. Brown, Polyfiber Ltd.

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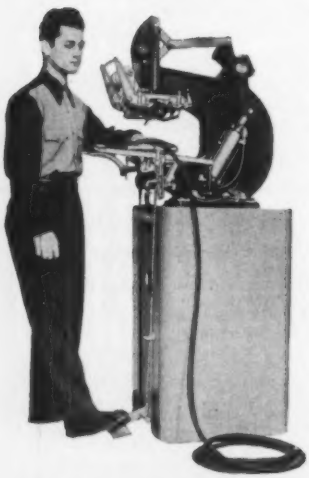

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THIRTYFIVE
(4" x 7" stamping area)
KENSOL

Compressed air power units compensate for the different overall thickness of plastics. Special make-ready takes care of the waves in plastics.

Can be operated by two hands, one hand or foot.

Send samples on your long run problems for an estimate on special high-speed production presses.

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Olsen Mark corporation
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More Phenolic in Record Changer

WHEN RCA-Victor Div., Radio Corp. of America launched a program to convert the turntable of its phonograph record players from metal to plastic, the major goals were cost reduction, increased parts output, and more rapid assembly of completed units.

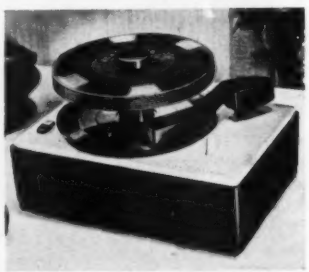
The problem presented to RCA-Victor engineers at the outset was the creation of a molded product requiring close tolerances and demanding a material which would provide dimensional stability. General Die Mold Co., Chicago, Ill., was called in, and that company set about to obtain a phenolic molding material with the desired properties.

After considerable experimentation with materials, a phenolic was developed by Durez Plastics & Chemicals, Inc., N. Tonawanda, N.Y., which offered the necessary combination of stability and free-flowing characteristics.

Important assembly advantages were achieved in the new phenolic turntable. Its lighter weight made handling easier and cut down shipping costs. An additional merit of the new material was a high gloss surface finish.

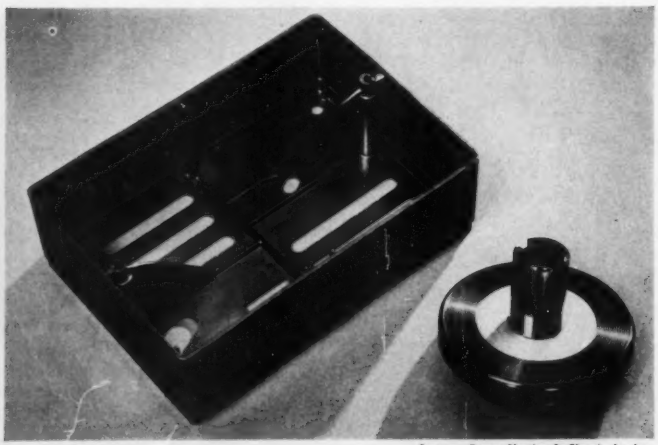
Most of the RCA-Victor record players and combination radio-record players in which the new turntables are being used also have molded Durez phenolic housings. A recent engineering change in the housing of one model illustrates the value and versatility of plastics. In the original design, two mounting bosses were molded-in. It was found that a strain occasionally developed through accidental misalignment in the mounting. By a slight change in mold design, reinforcing ribs were molded-in, successfully eliminating the possibility of such strain. In any material other than plastics, this modification would have entailed a prohibitive expense in die changes.

The turntables are being molded for RCA-Victor by General Die Mold Co., Kurz-Kasch, Inc., Dayton, Ohio, and Chicago Die Mold Mfg. Co., Chicago, Ill. The cabinets are being run by General Die Mold Co. and Kurz-Kasch, Inc.



Courtesy RCA-Victor Div.

Production economy, greater output result from molding turntable of phenolic



Courtesy Durez Plastics & Chemicals, Inc.

Mounting bosses of phenolic housing for record changer are strengthened by molding-in reinforcing ribs. Versatility of plastic material permitted design change at minimum cost

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In trucks, busses, automobiles, station wagons and tractors, vinyl seats take a beating. But the plasticizer —if it's one of the PARAPLEX resins— *won't come out for the life of the vehicle!*

These polymeric plasticizers (PARAPLEX G-25, G-40, G-50, and G-60) resist extraction by oil, gasoline, soapy water, and the endless rubbing of fabrics— withstand exposure to heat and ultra-violet light, too. They're a *permanent* part of vinyl upholstery, table covers, shower curtains, hose, and dolls.

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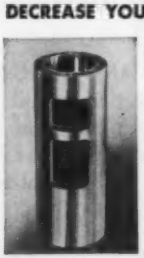

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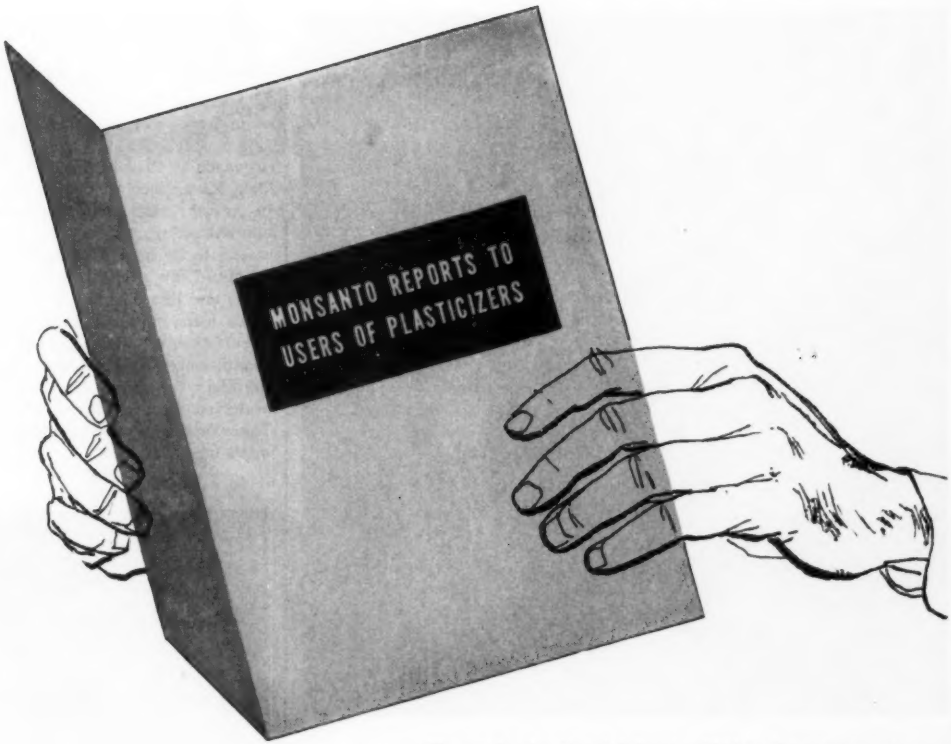
Battery Caps

AUTOMOBILE battery servicing is considerably simplified by the Sav-A-Battery, a new indicating device molded of transparent polyethylene which tells at a glance whether more distilled water is needed or if too much is being consumed. The product, made by Plax Corp., Hartford, Conn., for Sav-A-Battery, Inc., Jacksonville, Fla., consists of a blow-molded closed cylindrical filler cap with screw threads and a tube insert.

Sav-A-Battery eliminates the need to remove battery tops to determine the water level. When installing the device, washers are first removed from the battery which is then filled with water. Next the cups are filled with water to within about ¼ in. from the top (by squeezing twice, as with a bulb syringe), and the entire unit is screwed into the cap hole. In the case of a "high level" battery where cap tubes touch plates, the tubes can be pulled out, cut off about ¼ in. from the open ends, and reinserted in the stems up to the "stop" marks about 5/16 in. inside the neck.

Filler caps are produced in diameters of ¾, ⅞, 1, and 1¼ (small and large). Lettering is molded in and painted over in red. Polyethylene is impervious to the effects of the battery's electrolyic action. It will expand if the electrolyte freezes, but will not crack.

Polyethylene cap permits visual check of battery's water level



The needs of national defense, added to the extra requirements stemming from the rapidly-growing popularity of plastics products, have created demands in excess of Monsanto's capacity to produce Santicizers and other quality plasticizers.

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Today, we offer technical assistance, based upon the world's most extensive experience in plasticizers, to our customers. In many instances we may be able to help you make the best possible use of the plasticizers we are able to deliver.

For information on this technical service, which is available without cost or obligation, contact the nearest Monsanto Sales Office or MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second St., St. Louis 4, Missouri.

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We believe you will agree that draft horses make poor racers—that trotters would mess up a ploughing job. Flexible "equipment" is a must for *maximum* utility. What does this have to do with vinyl manufacturers? Simply to point out that better resins are produced when a *flexible* line of stabilizers, each engineered for a specific formulation is used.

There's no doubt about it! You'll be happier with the final result when you select stabilizers with an eye to the formulation of individual resins and plasticizers. Ferro's knowledge of stabilizer performance can help you. Our background records the solution of unusual problems for some of the largest producers of vinyls. As a result of intensive work in this field, experience indicates that stabilizers of single metals, used in combination, produce optimum activity. Ferro's Stabilizers of Barium, Cadmium, Lead or Stabilizers of Pure Organics or Phosphates are worthy of your investigation. Like more information?

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Display Panel

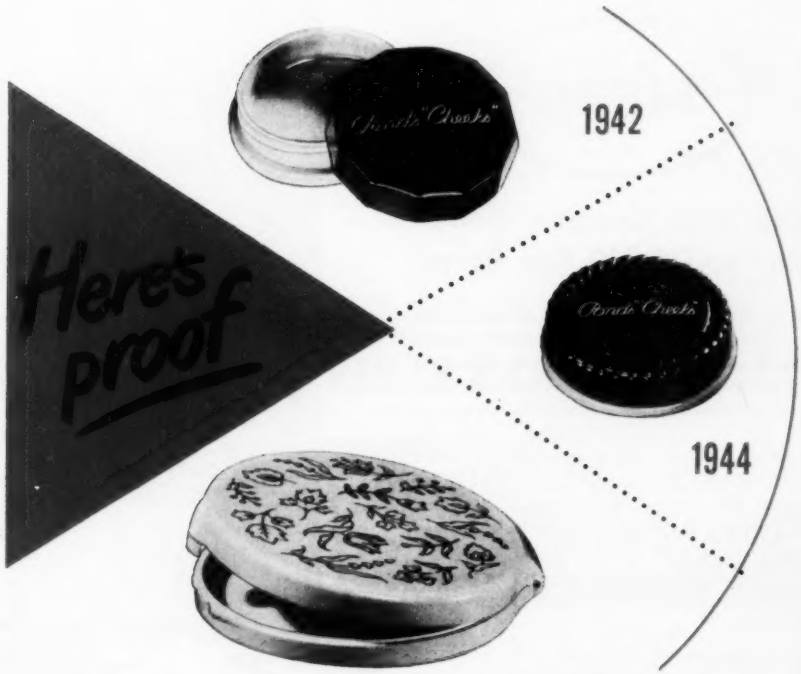
GROUPS of related products can be exhibited in pilfer-proof display cases formed in two rigid Vinylite sheets, each 0.030 in. thick. The cases are made by Plasti-Print, Inc., Royal Oak, Mich. Each product is cradled in its own individual compartment approximating the shape of the article to be held. The pockets are produced by preheating the back sheet and then forming it in a kick press, using male and female molds. Descriptions of the displayed merchandise are printed on the inside of the clear face sheet, and are thus protected from wear and abrasion. The two sheets are assembled with small lacquered rivets.

Photos courtesy Bakelite Div.

Items displayed and product description are visible through clear vinyl sheet

Compartments formed in the rear sheet conform to shape of articles to be held

CUSTOMERS RE-ORDER with confidence from NORTON



Customer: Pond's Extract Co.

WHEN MILADY buys a cosmetic, she rarely seems to give outward consideration to the container. But manufacturers know that women demonstrate an intuitive preference for cosmetic products which are displayed and sold in containers having visual appeal.

Since their customers are attracted by good appearance, and they are interested in reasonable prices and dependable deliveries, it's no surprise that Pond's Extract Co. has come to Norton again and again for molded plastic containers.

As far as Pond's is concerned, the years of contact have proven the value of Norton's engineering ability, cooperative service, flawless molding, sensible pricing and overall reliability . . . And we hope you will learn their value, too.

Norton is interested in cultivating *your* molding business. Ask for a free survey of your next molding assignment by a Norton engineer from our nearest sales office. Write today. Norton Laboratories, Inc., Lockport, New York· Sales Offices: *New York — 347 Fifth Avenue; Chicago — 5221 Kimbark Avenue.*

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BIPEL

Compression/Transfer Models Covering 20-300 Ton Range

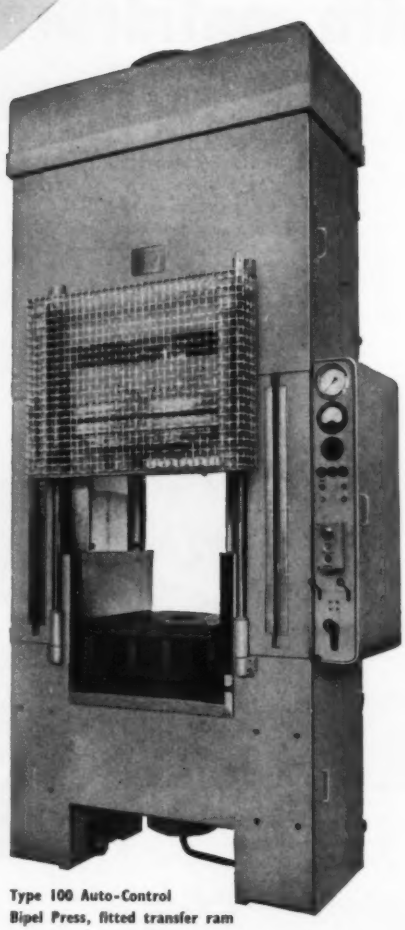
Designed originally for the molding division of the B.I.P. Group, originators of aminoplastic molding powders in Great Britain, these presses can be supplied either with individual drive contained within the press frame or preferably to operate in groups of up to 12 from a special 1000-p.s.i. pumping unit. Choice of operating pressures at each press: 1000, 2000 or 3000-p.s.i. from a novel built-in intensifier.

Completely flexible cycle controller eliminates the human factor, gives any conceivable molding routine and ensures constant product quality.

Tested for the last three years on a 24 hours a day schedule, these presses have shown a great reduction in rejects and operating costs.

There are three models:—

Type 40: Pressure range 20 - 60 tons
Type 100: Pressure range 50 - 150 tons
Type 200: Pressure range 100 - 300 tons



Type 100 Auto-Control Bipel Press, fitted transfer ram

BRIEF SPECIFICATIONS

FRAMES: Heavy steel plate, electrically welded, stress relieved, enclosing completely all hydraulic and electrical equipment. Water-cooled platens.

RAMS: Annulus type, hard chromed, fitted with C.I. piston rings.

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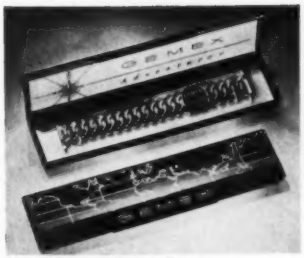

Courtesy Tennessee Eastman Co.

Gift box made of butyrate provides attractive display setting for watch band

Watch Band Box

ATTRACTIVENESS of the new Adventurer watch band made by Gemex Co., Union, N.J., is enhanced by a gift box of lustrous blue Tenite II cellulose acetate butyrate. The two-part box, molded by Thermold Corp., Clinton, N.Y., is brass-pin hinged and has a lug projection at the front edge for snap-fit closure. A map of the world and the word Gemex are molded-in the upper lid and lug and then wiped with gold. The box, measuring 1½ by 6½ by ¾ in., has no hinge stop, facilitating insertion of interior pads.

Bottle Kit

A TRIO of cosmetic lotions with all-plastic packaging has been introduced under the name Light Fantastic by Jacqueline Cochran, Inc., New York, N.Y. Three blow-molded, natural color polyethylene bottles—with urea closures—are supplied by Elmer E. Mills Corp., Chicago, Ill., and are distributed in a 12-gage Vinylite kit of the same color made by Columbia Products, Brooklyn, N.Y.

Vinyl kit holds three polyethylene cosmetic bottles which have urea closures

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By using a Bailey Mixer to give the materials a brief pre-mixing before they are loaded into your Banbury or calender, you can appreciably shorten the time these machines need to complete their cycles. Shorter cycles—more production per day; it's as simply as that!

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any plastic material

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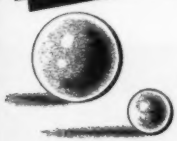

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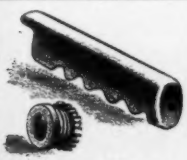

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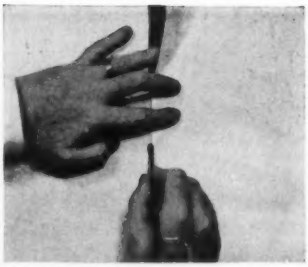

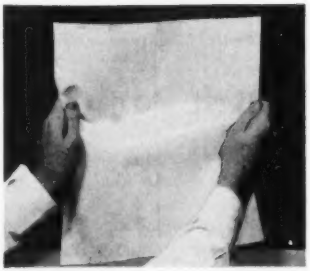

Liquid vinyl applied to seams of wall cover (top) provides permanent bond

Vinyl Seal

THREE years of laboratory research by Pantasote Co., New York, N. Y., has resulted in the development of a new colorless liquid vinyl which permanently seals and water-proofs seams in the company's Lifewall vinyl wall covering. Lifewall Seam Sealer minimizes unsightly seams, and is strong enough to create a bond which is actually as tough and as durable as the top coat of the Lifewall wall covering itself. Completely water-proofed wall surfaces are obtained with this new product with no danger of water penetration at the seams. In addition, the seam sealer prevents buckling, bulging, and bending in the Lifewall wall covering which results when moisture gets under the seams.

The strength of the sealer is demonstrated in a test wherein a sample of Lifewall, completely cut through, is treated with Lifewall Seam Sealer applied directly over the cut. After drying, the seam is extremely difficult to pull apart.

To use, the liquid is spread lightly on the seam with an ordinary brush; in 5 min. at room temperature the sealer is dry and the seam permanently sealed. The sealant is packaged in 4-oz. jars.

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NEW! compact . . . portable . . . 3-kilowatt unit

YOU CAN heat up to 2¼ pounds of general purpose material from 80 to 250°F in one minute with the Model 3R THERMEX Plastic Preheating Unit. Much faster mold closing and curing is then possible.

The mold cavity is filled easily and quickly. Uniform softening eliminates hard cores, strengthens the structure.

Operation is simple. When the operator closes the sliding drawer, high frequency power automatically comes on. After the proper interval, power is shut off by a timer.

The THERMEX Model 3R Heating Unit is compact—occupies less than 4 square feet of floor space. It is light, mounted on rubber-tired casters for portability. All parts are readily accessible.

As the first step in boosting your plastic molding production, write for more information. The Girdler Corp., Thermex Division, Louisville 1, Ky.

THERMEX—T. M. Reg. U. S. Pat. Off.

SPECIFICATIONS

Power Data—Power Requirements: 230-volt or 460-volt, 60-cycle, 3-phase. Power Input: 6.3 KVA at 90% power factor. Power Output: 3 KW.

Heating Capacity—Electrode area of 10" by 12" will accommodate preforms up to 3¾" thick. (Special electrodes to provide larger heating area available.)

Controls—Controls on front of cabinet include electrode height adjusting knob, plate ammeter, grid meter, grid adjustment knob, timer, and main circuit breaker.

Construction—Heavy gauge aluminum cabinet contains built-in material-heating compartment with electrode and preform handling tray.

Dimensions and Weight—21" wide, 24" deep, 53¾" high. Weight: 925 pounds gross, 800 pounds net.

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Thermex Division

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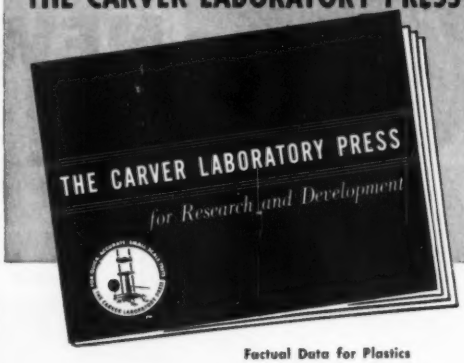

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THE first Exhibition and Convention of Britain's entire plastics industry will be held in London during the Festival of Britain. Staged in collaboration with producers of raw materials, manufacturers of plastics materials and equipment, moulders and fabricators, it will give *you* the opportunity of studying the finest display of plastics products and processes ever staged under one roof, and of meeting the experts of Britain's plastics industry. The Convention will be extensive in scope, covering technical, applied and general aspects of the industry and its materials. Special arrangements exist for overseas visitors—YOU will be welcome!

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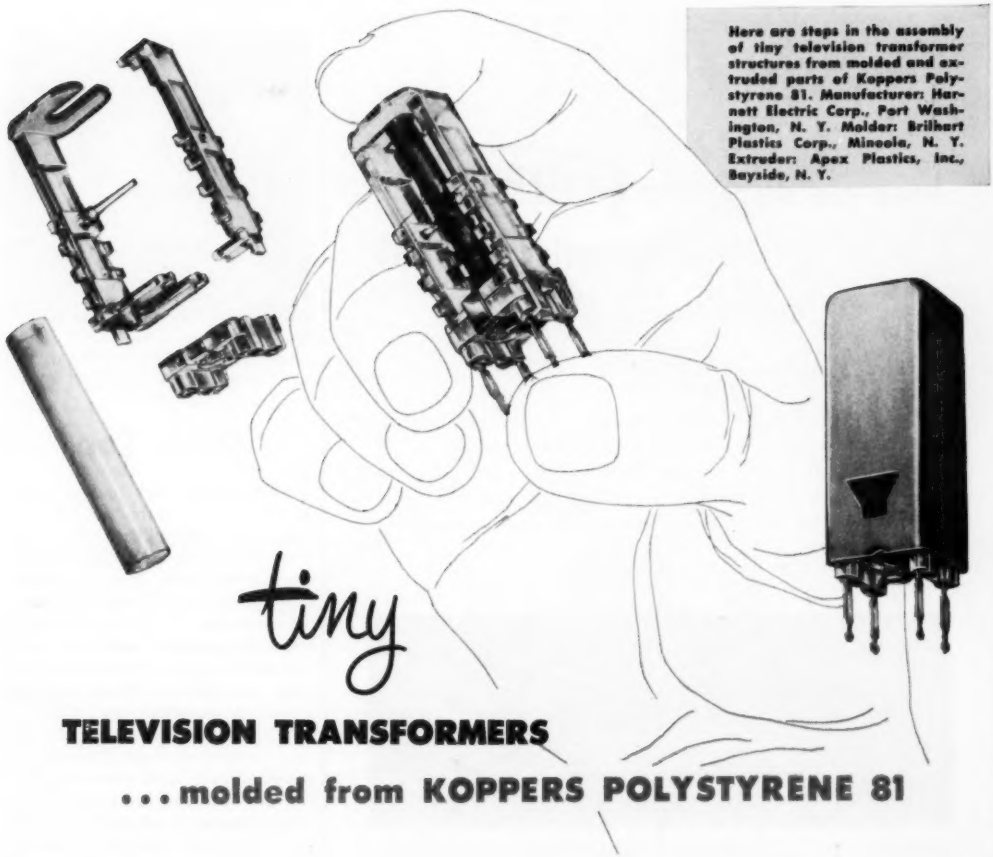

Here are steps in the assembly of tiny television transformer structures from molded and extruded parts of Koppers Polystyrene 81. Manufacturer: Harnett Electric Corp., Port Washington, N. Y. Molder: Brilhart Plastics Corp., Mineola, N. Y. Extruder: Apex Plastics, Inc., Bayside, N. Y.

tiny

TELEVISION TRANSFORMERS

...molded from KOPPERS POLYSTYRENE 81

EIGHT different types of television transformer structures are made from molded and extruded parts of Koppers Polystyrene 81 by Harnett Electric Corp., Port Washington, N. Y. These lightweight, low-cost assemblies are key parts in several leading makes of television receivers.

With top performance their primary consideration, Harnett engineers picked Koppers Polystyrene 81 for its high heat distortion point—chassis temperatures often reach 140°F. They picked Koppers Polystyrene 81 for its dielectric strength — dielectric loss and power factor are both extremely low in the high frequency range.

Economy, clarity and wide range of colors, though secondary in importance, were plus values from the use of Koppers Polystyrene for this job.

Since supplies are limited by defense measures, it is important to get best use of the available Koppers Polystyrene. Our engineers will be glad to work with you toward that end.

KOPPERS

Koppers Perfected Plastics

Koppers Polystyrene has made Many Products Better and Many Better Products Possible.

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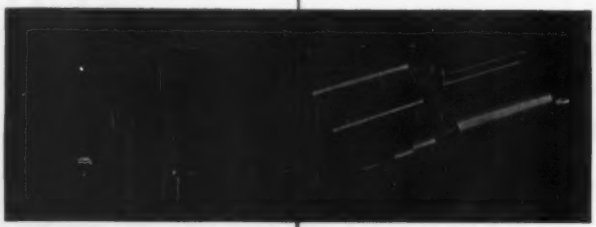
have you discovered FORMICA laminated plastics?

Formica is the toughest, strongest, most durable material you can buy in its weight class. It's half the weight of aluminum. Its strength-weight ratio compares favorably with steel. Meets or exceeds the standards set by N.E.M.A. Formica is excellent for electrical, chemical or mechanical applications ... and comes in



SHEETS from .010" up to 6" thick ... from 24" wide by 42" long in some grades up to 36" wide by 96" long in others. Formica can be punched, turned, milled, drilled, threaded and stamped on machinery already in your metalworking or woodworking shop.

TUBES AND RODS Tubes from 3/32" to 19" I.D. and in wall thickness from 1/32" to 2" ... in lengths to suit your requirements up to 36". Rods from 1/8" to 2" in diameter. Both rods and tubes may be rolled, or molded if some unusual shape is desired.

POSTFORMED SHAPES Formica's postforming process forms special grades to special contours. Postforming and molding have been combined successfully by Formica.

MOLDED FORMS Molded Formica combines laminated sheets, tubes, rods and macerated stock to create almost any shape for unequalled toughness and durability.

Why don't you discover Formica, too? Send today for your free illustrated brochure.

THE FORMICA COMPANY
4531 SPRING GROVE AVE.
CINCINNATI 32, OHIO

Productive
FORMICA
at Work in Industry

Courtesy American Cyanamid Co.

Pencil and crayon marks can easily be wiped off melamine-surfaced desk top

Desk Top

SCRIBBLERS and initial-carvers will have a hard time leaving their mark on laminated desk tops manufactured by Fiberesin Plastics Co., Oconomowoc, Wis. The desks, supplied by H. R. Winton, Chicago, Ill., are made with Fiberesin tops—durable laminates surfaced with melamine resins—which resist chipping and peeling. Pencil and ink marks can be easily wiped off.

The core material of the decorative laminate is 5/8-in. thick Resinwood, a wood waste board supplied by Rock Island Millwork Co., a Weyerhaeuser Lumber Co. subsidiary. This core consists of ground soft-wood fibers compressed with a phenolic resin binder. When the core board is received by Fiberesin, it is surfaced with a decorative sheet impregnated with American Cyanamid Co's. Melmac melamine resin. The melamine surface is applied directly to the top and bottom of the Resinwood core in a high pressure, multiple-opening hot plate hydraulic press. The result is a dense, hard, homogeneous structure with balanced high-strength faces.

The strength of the resin wood core, which can be shaped and finished in the same manner as the better grades of hard wood lumber, permits edge-finishing without the use of metal molding or attached wood edges. In addition to its excellent machinability, Fiberesin decorative board can be produced at a lower cost because secondary sanding and gluing operations are omitted.

The board is manufactured in various stock sizes, as well as in finished cut-to-size desk tops.

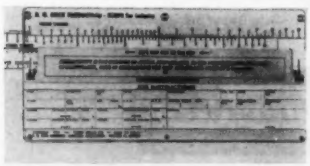
Slide Rule

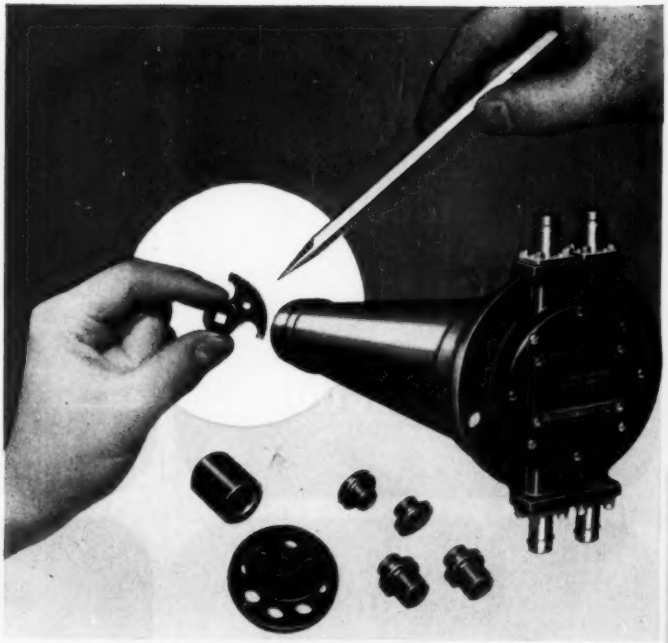
WITH machine operating efficiency ticketed to receive greater emphasis during the mobilization speed-up, methods for keeping close tabs on the pace of industrial output will come in for a large share of attention. One recently developed device for this purpose is a slide rule—made of dimensionally stable Vinylite rigid sheet—whereby the production rate of a job can be checked while the job is running. At the same time troubles which might boost production costs can be eliminated during operation.

The rule, which is set by the machine to be checked in full view of the operator, is made by R. G. Bock Engineers, Chicago, Ill. It consists of a movable scale, on which are set the hours earned, and a stationary scale, directly above, for hours worked. Periodically, the number of pieces finished on a given operation are counted, and the quantity is interpreted in terms of earned hours. This is done by means of colors printed on the movable slide (green to the left and red to the right). When the green shows, productivity is above standard expectancy of 100%, while a red signal on the rule indicates a productivity below 100%.

Vinyl was a logical choice for the device, since the rule is constantly exposed on the machine and must be able to resist machine oils and most chemicals as well as warping and combustion. A recess made as part of the gage holds job slips.

Vinyl slide rule (top) permits on-the-machine check of output rate (bottom)
Courtesy Bakelite Div.





the Aircraft industry has discovered

FORMICA laminated plastics

Where operating conditions are really tough . . . there you'll find Formica laminated plastics doing a real job for aviation. Aviation Engineering Corp., for example, required super electrical insulation for unfailing performance through a temperature range of −67° to 167° F! Formica YN-25—a nylon base laminate bonded with low loss resin—was the perfect answer. Seven different parts made of this miracle material assure top efficiency of the Avien fuel gage shown above.

Formica YN-25 offers outstanding electrical properties . . . plus good mechanical qualities. It has a low dissipation factor (resists the passage of alternating current at very high frequencies) . . . and has very low moisture absorption and good machinability as well. In the field of electrical insulation YN-25 is without equal.

Formica is performing an equally important job in electrical, mechanical and chemical applications for commercial and military aviation. Its unusual properties have helped perfect many new top-secret military techniques.

Formica No-Glo NAS aircraft pulleys have been helpful in preventing secondary fires. This development represents an important step toward the ideal of completely non-combustible pulleys.

Discover for yourself how neatly Formica can improve your product or manufacturing processes. Start now . . . send for descriptive 16-page Formica catalog . . . use handy coupon below.

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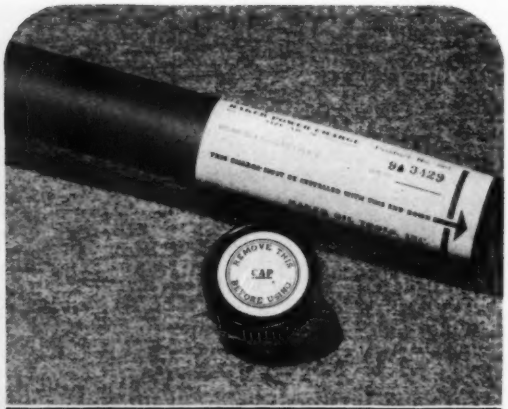
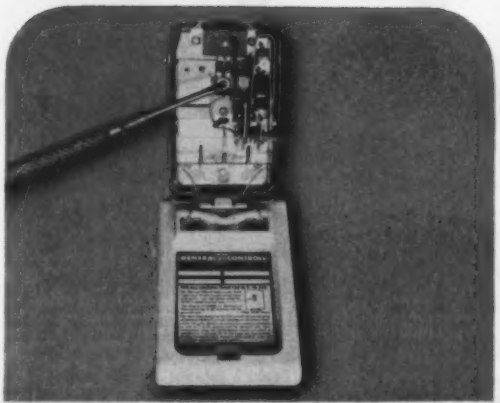
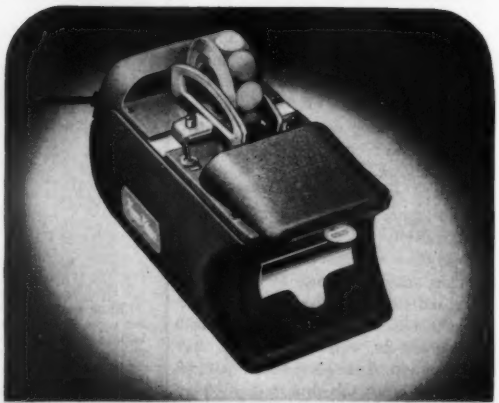
informative labeling in defense production...



Baker Oil Tool Company applies warning data on-the-product with Kum-Kleen labels...



General Controls Company applies instructions on-the-product with Kum-Kleen labels...



...and with production line speed, *free of expensive equipment costs!*

You can use pressure-sensitive Kum-Kleen labels in many ways to increase production and reduce maintenance and service time. Use Kum-Kleen labels for inspection, rejection, trademark identification or instructions for assembly, installation, maintenance and service information. Kum-Kleen labels stick-and-stay-stuck to all plastic surfaces, as well as cellophane, pliofilm, plastics, wood, metal, etc. They will not pop or curl, even in extremes of heat and humidity. Thus,vital information is permanently anchored to the product so long as it is needed. Yet, Kum-Kleen labels can be removed without damage to even the finest surfaces. Kum-Kleen labels can be used with lightweight, portable hand dispensers or special Avery electric dispensers for labeling at production line speed...*free of expensive equipment costs.* Kum-Kleen labels are available in standard sizes, or can be produced to your exact requirements and printing specifications.

Write for samples and prices

Kum-Kleen®

AVERY ADHESIVE LABEL CORPORATION

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CLEVELAND: 2123 East 9th Street
PHILADELPHIA: 1069 Commercial Trust Building
CHICAGO: 608 South Dearborn Street
CINCINNATI: 626 Broadway Street
MONROVIA, California

Representatives In All Principal Cities

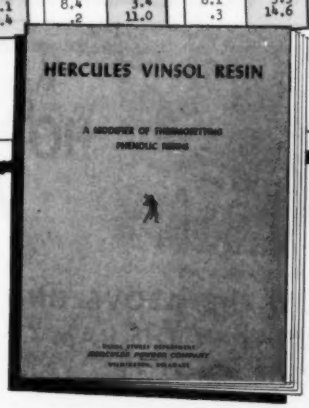
PROOF THAT VINSOL® RESIN CAN

Conserve Scarce Phenolics Without Lowering Quality!

	With Phenolic	With "Vinsol"	With Phenolic	With "Vinsol"	With Phenolic	With "Vinsol"	With Phenolic	With "Vinsol"
Impregnating Solutions								
Phenolic Resin (Based on Solids)	100	50	100	50	100	50	100	50
Vinsol (Based on Solids)	-	50	-	50	-	50	-	50
pH	7.75	6.6	7.75	6.6	7.75	6.6	7.75	6.6
Impregnated Paper								
Drying Time (Minutes at 105°C.)	10	10	10	10	10	10	10	10
Pressing Time (Minutes)	20	20	20	20	20	20	20	20
Pressure (p.s.i.)	1500	1500	1000	1000	750	750	1000	1000
Temperature (°F.) *	350	350	350	350	350	350	275	275
Properties of Cured Kraft Paper Laminate								
Percent Resin Content	49.7	49.3	50.4	50.4	48.8	50.6	48.7	49.8
Flexural Strength (p.s.i.)	18,500	18,300	18,500	16,900	16,300	17,000	16,900	18,900
Flexural Modulus (p.s.i.)	850,000	910,000	870,000	873,000	710,000	760,000	790,000	920,000
Angle of Bend (Degrees)	17	16	16	15	15	17	15	19
Rockwell Hardness (M Scale)	106	114	103	112	64	109	91	115
Specific Gravity	1.31	1.38	1.31	1.37	1.20	1.34	1.28	1.38
Percent Volatile	.76	.32	.66	.32	.99	.31	.70	.20
Percent Water Absorption (24 Hours)**	3.9	3.3	3.3	3.1	8.4	3.4	6.1	3.3
Percent Acetone Extractable	.2	9.9	.3	10.4	.2	11.0	.3	14.6

* Cooled in press.
** Water absorption samples 1/16 inch thick.

Note: All formulations are given as parts by weight.



THIS TABLE shows comparative values of paper laminates in which one of the impregnating solutions was a commercial phenolic varnish and the other a "Vinsol" modification of the commercial phenolic varnish. Any losses in end properties are negligible. "Vinsol" has even improved physical characteristics in some instances. These results are typical of many investigations conducted by Hercules on laminating, molding, and other phenolic formulations.

Today, especially, it will pay you to evaluate "Vinsol" as a phenolic extender or modifier. Priced at less than 5¢ per pound, this dark-colored, high-melting thermoplastic offers substantial savings in total resin costs. Send for generous testing sample.

FREE 24-PAGE BOOKLET

The table shown above is reproduced from this new Hercules booklet. It is one of many which indicate the opportunities that "Vinsol" Resin offers in conserving phenolics in the production and use of phenol-based solutions and molding materials. Write for your copy of this helpful booklet. We will be glad to provide specific technical advice if you'll tell us where you think "Vinsol" could conserve your phenolic supply.

HERCULES POWDER COMPANY 916 Market Street, Wilmington, Delaware

NV51-2

PHENOPREG MATERIALS

for LAMINATING and MOLDING
high pressure • low pressure

PHENOPREG materials represent a wide variety of resin impregnated materials for laminating and molding. They offer unlimited possibilities for the production of decorative laminates, all grades of industrial laminates, molded laminates, structural assemblies, reinforcement of molding compounds and many specialized products.

PHENOPREG materials are treated with phenolic, melamine, diallyl phthalate, BCM and polystyrene resins.

PHENOPREG materials are resin impregnated fabrics, such as duck and linen, papers, including decorative, Kraft, Resin X Crepe and a number of specialized items, Fiberglas cloth and Fiberglas mat.

We can supply stock grades or specialized material to fit any laminating applications. Ask for a sales engineer to assist you with your technical problems. Write TODAY to

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PLASTICS DIVISION

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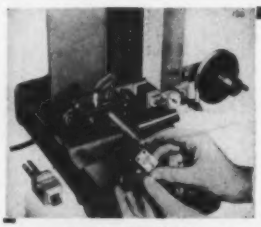

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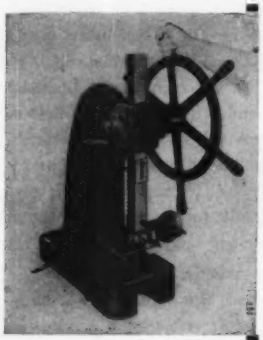
HOT STAMPING MACHINE

Hercules No. 3 Unit
BUY THE ABOVE UNIT PUT IT IN THE RAM OF YOUR –

ARBOR
FOOT or
PUNCH PRESS

for GOLD, SILVER or COLOR STAMPING OF PLASTICS AND PAINTED METALS, WOOD, FIBRE ETC.



Hercules No. 3 UNIT ASSEMBLED IN HERCULES ARBOR PRESS for Hot Stamping Crystal Holders

ACROMARK
THE ACROMARK COMPANY
5-15 MORRELL ST. ELIZABETH, NEW JERSEY

Reinforced Plastics

(*Continued from* pp. 55-9)

Diallyl phthalate resins produced by Shell Chemical Corp., New York., N.Y., are beginning to create much interest in the reinforced plastics field. There are three types of these resins: a) a prepolymer; b) a mixture of 85% polymerized DAP plus 15% DAP monomer; c) a mixture of 95% polymerized DAP with 5% DAP monomer. The polymer is not supplied solid; it is provided as an acetone solution for molding and laminating work. The combination polymer-monomer resins are activated with any of the peroxides as catalysts and cure with some application of heat. The company also supplies DAP monomer which can be used like styrene for cross-linking unsaturated alkyd resins.

None of the Shell resins appear to be used for conventional mat work, although they are all used for molding. One of their greatest advantages is in the loading of a glass fabric, either woven or unidirectional, to produce a loaded fabric which can be stored indefinitely with slip-sheet protection and used at any time for layups in large piece molding.

The Shell DAP resins are stated to have greater heat resistance generally than the styrene-based resins; they are not fire-proof but will accept chlorinated compounds in combination with antimony oxide for fire-proofing. The DAP resins have unusually good electrical properties, show good high temperature aging, and are declared to have improved heat distortion characteristics. As pointed out above, heat is required to cure DAP resins; no "sunlight catalysts" have yet been used effectively with them.

Bakelite Div., Union Carbide and Carbon Corp., New York, N.Y., an important factor in the low pressure reinforced plastics field during World War II through its production of both low pressure phenolics and polyesters, is now back in the field with a series of styrene-based polyesters ranging from hard to flexible. Bakelite polyester resin QRS-81 is a general-purpose, liquid resin developed for structural applications. It is particularly serviceable for matched die molding but can be employed in all the common types

(*Continued on p.* 149)

H-P-M's NEW "9 oz." BREAKS PRODUCTION RECORDS!

Rejects cut from 7% to less than 1%

At Columbus Plastic Products, Inc., one of the country's largest injection molders (over 1 million lbs. of thermoplastic material per month), this new H-P-M "9" is outproducing any comparative machine. For example: 2600 more butter dishes per day on a four-cavity mold.

George Kelly, C. P.'s General Supt., says: "It's the best machine H-P-M ever built!" (he should know, since he operates 41 machines, 17 of which are H-P-Ms). "I particularly like the hydraulic power unit mounted out in the open where it is easy to service. I also like the closed oil tank on one end of the machine which makes it impossible to get water in the hydraulic oil. Color change is easy, too! We really like this new machine."

One look at this new H-P-M 9 oz. will convince you, too, that it has superior operating features. It's designed to give you more quality parts per hour regardless of whether they are shallow or deep draw jobs. Write today for complete specifications.

HPM

PLASTICS MACHINES FOR EVERY MOLDING JOB

THE HYDRAULIC PRESS MFG. CO.

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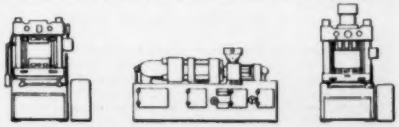
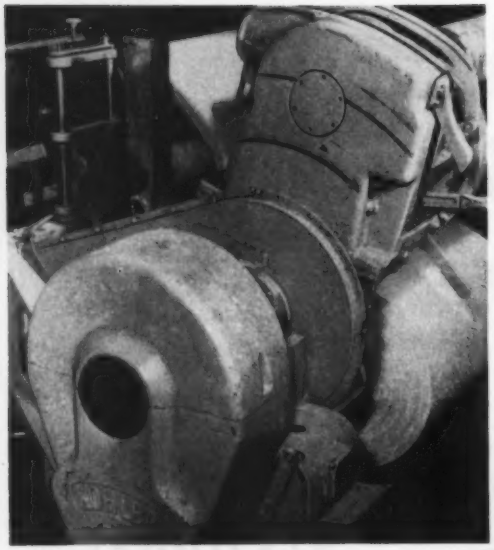


COMPRESSION INJECTION TRANSFER



New Kohler System Plastic Winder

• Here it is, a new plastic winder—by Dilts—that may exactly meet your requirements.

One by one, check and consider the following operational features and time and money saving advantages:

1. Center winder.
2. Controlled tension.
3. Roll change at full web speed.
4. No waste on strike-in.
5. For film and sheeting.
6. Slitting for trim or narrow rolls continuous. Trim slitting uninterrupted.
7. Adjustable size roll slitting.
8. Controlled length of roll-metered.

With this new plastic winder you could (1) increase production, (2) decrease waste, (3) form better rolls, (4) save money.

Contact us. See it yourself.

Dilts Machine Works

FULTON, NEW YORK

KOHLER SYSTEM EQUIPMENT

PRODUCT OF DILTS

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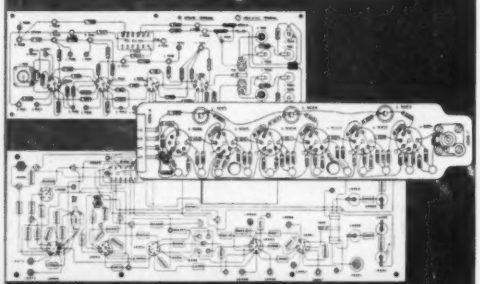
The Advantages of Plastics



It will pay you to fabricate your schematic diagrams in plastics. It's the best way to protect important instructions from soil and damage—superior to paper and more practical than metal.

Sillcocks-Miller engineers are specialists in this precision work and can develop and produce these diagrams to your exact specifications.

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Write for details and quotations.

18 W. Parker Ave., Maplewood N. J.

of molds in current use today. It is adaptable to molding at both room and elevated temperature and requires only standard catalysts. It does not precure. It retains its mechanical strengths and electrical values at operating temperatures.

QRS-136 is a flexible resin sold as a non-plasticized liquid. It has found greatest service to date as a modifier for use with other polyester resins to impart toughness and resistance to impact. It is not intended for service where the electrical insulating requirements are critical.

QRS-17560 is a high viscosity resin for casting or molding, especially suited for preform work. QRS-140 is a medium viscosity resin developed especially for high frequency insulation requirements.

BRS-16631 is a low viscosity resin possessing superior low-loss characteristics for high frequency insulation. Its low viscosity provides ease of impregnation or wetting of the fibers. Somewhat more difficult to mold than the other grades of polyesters, it must be held at a low temperature for a time to produce relatively void-free structures.

Genpol Resin A-20 made by The General Tire & Rubber Co., Akron, Ohio, is a new casting and laminating material supplied in unmodified form to be mixed with styrene monomer and to be used in combination with other polyesters of the rigid type.

A line of styrene-based polyesters is available from Synvar Corp., Wilmington, Del., and that company makes a specialty of compounding and mixing on a custom basis, particularly where specific resin properties are required for long runs.

Resin-Reinforcement Combinations

Beyond the resins and the reinforcements come new materials which are combinations of both and which open up new opportunities for molders and laminators, particularly on defense jobs. Three of these materials, which are the sole development of molders in their own plants, will be discussed later in this series. They are molding materials and are not supplied in layup or mat form.

In addition, there are such materials as Dryply—glass cloth, unidirectional material, or mat impregnated with a catalyzed polyester-

(*Continued on p. 152*)

Whatever YOUR PLASTICS Problem . . .

JETNESS ✓

CONDUCTIVITY ✓

DURABILITY ✓

CABOT *can help you*

The Cabot Technical Service Staff is thoroughly prepared through training and experience to help solve whatever detailed problems of manufacture you have in trying to increase the jetness, conductivity or durability of your plastics products. Our advice may simply involve the use of a specific Cabot black, or it may also suggest changes in procedure and technique.

Technicians in the Cabot Laboratories are constantly at work on various kinds of plactics problems. Whether they are already familiar with yours, or whether it is entirely new, you can be sure of receiving our full and confidential co-operation.

Our job is to help you; we can do it if you'll let us. Simply call or write our Special Blacks Department or drop in to see us — we may already have your answer.

GODFREY L. CABOT, INC.

WHAT THEY'RE* USING FOR HIGH STRENGTH PARTS

.... *and why!*

*** BULLDOG ELECTRIC PRODUCTS COMPANY**

ROGERS RM-12338

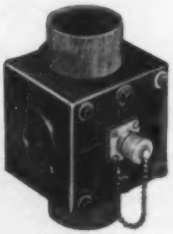
PART: Vacu-Break Switch Head

MOLDER: The RICHARDSON COMPANY

Strength and toughness to withstand punching, fabricating and riveting operations after molding.

Reduced the number of parts used in forming the head, thus effecting a substantial decrease in labor costs.

Mandatory for operation of Vacu-Break Switches that material used in HEADS have unusual stability and not be affected by atmospheric conditions.



*** AMERICAN PHENOLIC CORPORATION**

ROGERS RM-15000E

PART: Antenna coupling for Signal Corps

High impact strength.

Part, weighing one pound, was drop-tested from heights of 12 feet. Did not chip or crack.

*** LIONEL CORPORATION**

ROGERS RX-421

PART: Housings, switch bases, coil forms

Stands up under the shock of trimming and riveting on a punch press.

Provides a firm, non-cracking grip for self-tapping screws, eliminating need for metal inserts.

Smooth, gleaming surface assures eye appeal for visible components.

Write for "Here's Rogers and Its Fiberloys" — Dept. P, Rogers Corporation, Manchester, Conn. This entertaining booklet will help you decide if our plastics and other Fiberloys by Rogers have a place in your products.

Better Parts for Better Products

ROGERS

CORPORATION

Established in 1832

Can "Rez-N-Dye" Metallize Plastics?

No, "REZ-N-DYE" cannot metallize plastics.

However, after your plastic objects have already been metal coated and lacquered, a final quick dip in "REZ-N-DYE" will add brilliant color and sales appeal — in seconds!

A simple dip and rinse of your already metallized object in yellow "REZ-N-DYE" will give your previously treated plastics a gleaming GOLD appearance.

Beautiful copper, antique or pastel effects can also be achieved — instantly — with other "REZ-N-DYE" colors.

Remember . . . metallize and lacquer your plastics first . . . then dip in "REZ-N-DYE" to give it beautiful color and matchless eye-appeal.

Schwartz **CHEMICAL CO., INC.**

328 West 70th St. New York 23, N. Y.

PLASTIC MOLDS

The above mold, weighing 5 tons, measuring 62" x 32" x 14", was made for the Panelyte Division of St. Regis Paper Company.

Send for our bulletin on your company letterhead.

EAGLE TOOL AND MACHINE COMPANY
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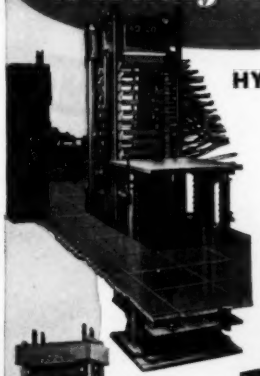
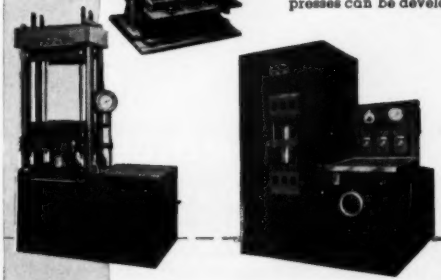
. . . for the Plastics Working Industries



HYDRAULIC PRESSES

R. D. Wood presses assure even heat distribution, positive guiding, great rigidity, and uniform pressure distribution. Usually R. D. Wood Hydraulic Presses can help do a better job—more economically. Many standard presses are available, and special presses can be developed.



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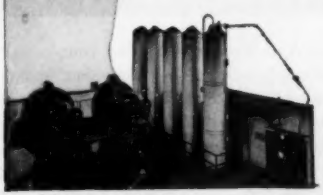

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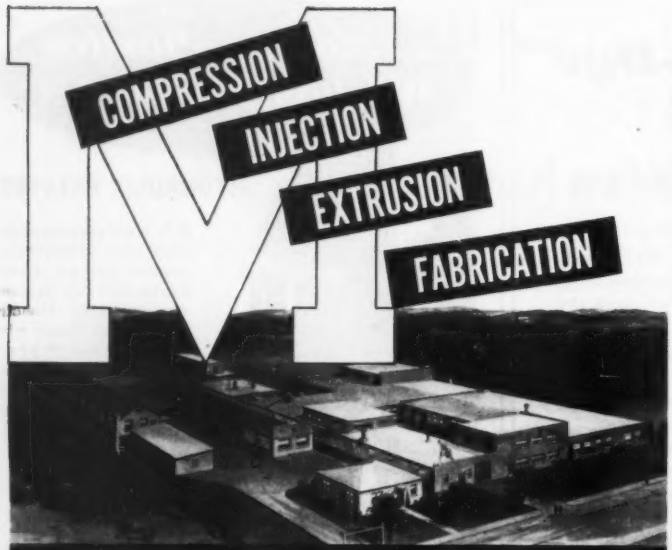

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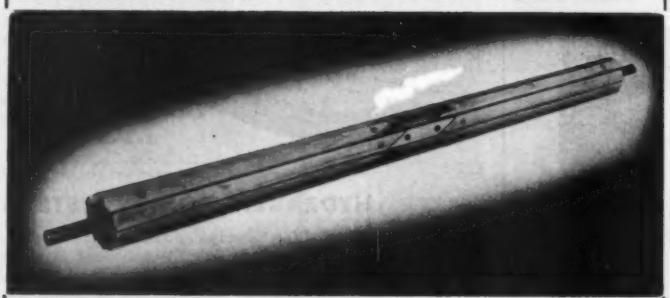
STOPS FILM FROM WRINKLING!



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type resin mechanically applied and delivered in a dry form ready for cutting out and laying up. The product, made by Flexfirm Products Co., El Monte, Calif., remains dry until heat is applied, then passes through a liquid state and jells again quickly. It is declared to require only contact pressure for forming and that sections can be cured in 15 sec. or less. It is manufactured in a variety of weights and thicknesses and has a shelf life of six months or longer at room temperature. It is currently of special interest to aviation.

Other companies supplying glass material of various kinds impregnated with polyester resins for delivery to users include: Fabricon Products, Inc., River Rouge, Mich., with treating plants in River Rouge, Los Angeles, and Philadelphia; U. S. Polymeric Chemicals Co., Stamford, Conn.; Western Waxed Paper Co., Los Angeles, Calif.; Du Mont Industries, San Rafael, Calif.; and Coast Mfg. & Supply Co., Livermore, Calif.

Added to the materials picture must be the preform binders and inert resin extenders. These were thoroughly covered in our October, 1949 article, and there appear to be no additions at this time with the exception of some unsaturated process oils being supplied by various petroleum companies, so far on an experimental basis. These reactive liquids may be used to an extent of up to 25% with most polyester resins, it is indicated, are unlimited in quantity, cost only 15¢ a gallon, and may be used in some cases in extending resins either to lower cost or to stretch supply.

Military Boats

According to development engineers now working on defense projects, there are nine basic nonclassified defense applications for reinforced plastics. First come boats. Here, the materials have thoroughly proved themselves in several sizes of both civilian and naval boats. The success of the small boats made by Winner Mfg. Co., Inc., Trenton, N.J., and the 9-, 13-, and 24-ft. Beetle boats (see MODERN PLASTICS, Sept. 1949, page 103), as well as those produced by Triangle Boats and others on the Pacific Coast, has been matched by the experience of the Bureau of Ships with larger units.

(*Continued on p. 155*)

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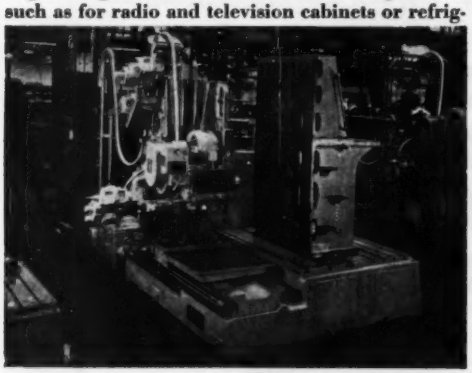

eration parts. The shape of the master form is accurately and rapidly reproduced in the new mold through automatic electrical controls.

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Plastic molders everywhere have discovered there is nothing like a Moslo Universal Minijector for cutting injection molding costs and increasing production. All thermoplastics including vinyls and Nylon are molded fast and smoothly on a Minijector.

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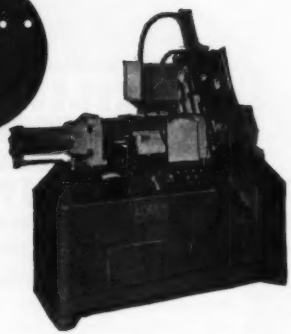

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The famous 28-ft. personnel boat produced by Winner (six have been made) has had a year and a half of active duty and has come through in magnificent condition. Marco Chemicals, Inc., and Anchorage Plastics Corp., Warren, R.I., have each made three large landing craft which have been undergoing severe tests. At the Puget Sound Naval Shipyard, 60 wherries, 12 ft. long, were produced at the rate of one a day and are giving good service.

More personnel boats will be made, as well as dinghies, wherries, whaleboats, pontoons, floats, cargo boats, surf boats, and assault boats. By far the most spectacular boat project ever conceived is now being tooled up at Puget Sound. It is for a 36-ft. LCVP to be made on a steel male with a reinforced plastics female mold, using both glass mat and glass cloth and a resin that will cure without application of heat. The layup will be dry and the resin will be applied by the Marco principle (see MODERN PLASTICS, Oct. 1949, page 71) of introducing the resin into the filler after the mold is closed. Ultimate target speed for this production is one boat a day; if three or four prototype molds can be set up, these big boats may be made at speeds that could be equalled with no other materials.

Other Applications

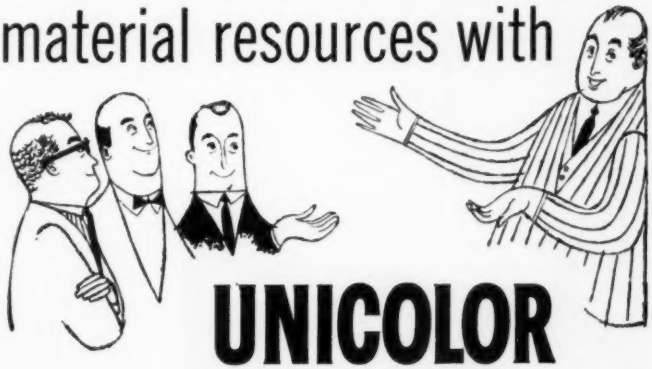
Ammunition boxes are a "natural" for reinforced plastics, particularly for molded preform jobs. New thinking on these units as far as strength is concerned indicates that some work will be done on the fabrication of flat reinforced material with metal binding and strengthening channel. (See page 74 of this issue.) Tote boxes of all kinds fit into the same category. Carrying cases for cameras, tools, medical supplies, are well along in the development stage.

Battery cases for defense use are in the course of design. There is no indication yet of the method that will be used or the possible volume of this application. Reinforced plastics are sound for the purpose and offer the great advantage of light weight. Containers for many chemicals, including bleaches, are also on the list.

Helmets are already in the works for airplane pilots, firemen, demolition forces, and even assault troops.

(*Continued on p. 156*)

how you can husband your material resources with



UNICOLOR

If you can cut costs by 3¢, 4¢, or 5½¢ a pound; if you can cut inventory costs; if you can prevent inventory losses; if you can prevent production delays; if you can increase molding equipment capacity —would that improve your corporate balance sheet? Then read these simple questions and answers about the revolutionary resin color concentrate, Unicolor:

Q. How does Unicolor work?

A. Unicolor comes to you in granular or pellet form. It forms a molecular bond with the thermoplastic you use; it fuses and combines with it into a molecular blend that distributes the color uniformly throughout the mass.

Q. Are special skills, special machinery needed?

A. No. Any operator can mix Unicolor without special equipment or special know-how. Coloring and molding are simultaneous. No more material need be prepared than a specific job calls for. One simple weighing, and you get the correct proportion of pigment to uncolored resin. (1 part Unicolor to 24 uncolored resins for electrical insulation and general purpose extrusion; 1 part Unicolor to 6 parts uncolored for injection molding; proportions of specially compounded Unicolor to uncolored vary for streak-free thin film.)

Q. Does Unicolor create new production problems?

A. No. Unicolor does not affect the physical or chemical properties of the plastic it is used with; it does not interfere with normal extrusion rates; it does not produce blemishes or blisters; it does not mottle or streak or bleed. Unlike dry powders, it does not fly and contaminate other machines. It cannot clog screens.

Q. What about my special problems?

A. We are custom compounders, and can handle any special problem immediately and efficiently. A wide range of popular, standard NEMA colors are available for immediate delivery, but special colors can be scientifically matched, quickly compounded and delivered. An informative folder detailing the facts on costs savings, method of handling special color problems, and the simplicity of plant handling of Unicolor, is yours on request.

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Sheet size—36" x 72"

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For two years we have dreamed about a super press that will make much larger fiberglas-reinforced plastic parts in matched metal dies than have ever been made before. Large parts have been made using inadequate temporary molds and very low pressure, but only by using matched metal dies and positive pressure can quality, uniformity and low cost be obtained.

We have two large presses on order, with production scheduled for May. You may order flat sheets now, or you may place orders for tooling for shaped parts. A few suggested items are: shower stall walls, refrigerator food liners, panels for building use, vats, or door liners.

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In general, these helmets will be molded from preformed material.

Shelters for personnel, vehicles, and plane parts, and shelters for maintenance work have been designed and a few made in pilot quantities. Here, the units are likely to be large and structural in nature, amounting to specialized prefabricated housing from reinforced plastics. Complete standardization is indicated because if this program proceeds, the volume should be large.

Shipboard pipe is being produced by several companies, and test installations are now being developed. The problem of corrosion resistance has been pretty well overcome, but there are many other factors still bothersome, such as fire resistance and means of assembly by bonding.

Not related to piping, but an even more strategic matter is the whole series of reinforced plastics tube projects which largely involve ordnance applications. Here, the problems are bound to be serious, and development is even now under priority and secrecy.

Radomes in the present program, as in World War II, will again constitute a major application for reinforced plastics. It is estimated that well over $50 million worth of radomes have been made of reinforced plastics in the past seven years. The variety of types and sizes of radomes is infinite, ranging from small units which may be press molded from mat to ground units as big as 28 ft. in diameter.

There is a whole host of minor defense applications of reinforced plastics which can run into good volume. These include field furniture, such as chairs and collapsible desks; sleds; skis; electrical, electronic, and refrigeration components; and many others.

A couple of months ago there were some unfortunately premature press reports concerning reinforced plastics for landing mats. Inquiries by MODERN PLASTICS indicate that the development program is being continued, but how soon even educational contracts will be released is a secret of the Corps of Engineers.

It would certainly appear that our bright baby of World War II is going to be a big factor in the present defense program *if* supplies of resins and glass are available and *if* molding and fabrication capacity suffices.

(Next month—Part Two)

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To obtain any of the booklets or catalogs listed below, simply circle the corresponding number on the post card, fill in the information requested, and mail.

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WHEELCO CONTROL INSTRUMENTS. Condensed catalog containing brief descriptions of typical Wheelco indicators, controllers, and combustion safeguards. Includes price list. Wheelco Instruments Co. (3-801)

MOLDING INFORMATION FOR PLEXIGLAS. Twelve-page pocket manual telling how to overcome unbalanced or improper molding conditions when using Plexiglas injection molding powders. Rohm & Haas Co. (3-802)

MOLDING FIBERGLAS REINFORCED PLASTICS. Four-page catalog insert illustrating how Fiberglas reinforced plastics are molded to form a one-piece dishwasher tub. Owens-Corning Fiberglas Corp. (3-803)

PLASTICIZER. Technical data sheet describing specifications, physical properties and solubility of a new type of Octyl Phthalate plasticizer. Burgess Pigment Co. (3-804)

VINOSOL PRINTING INKS. Described in this technical data sheet is a new series of pigmented Vinosol inks suitable for novel and decorative effects on fabric and paper. American Resinous Chemicals Corp. (3-805)

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DRY COLORING POLYSTYRENE. Product information bulletin giving complete data on techniques for dry coloring Lustrex styrene colorant blend molding compound. 16 pages. Monsanto Chemical Co. (3-808)

INJECTION MOLDING MACHINE. Folder containing features and specifications of the Windsor heavy-duty self-contained 8-oz. injection molding machine. R. H. Windsor Ltd. (3-809)

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AUTOMATIC MOLDING PRESS. Advantages and features of the Stokes No. 741 completely automatic molding press are treated in this four-page bulletin. F. J. Stokes Machine Co. (3-811)

ACRYLIC COPOLYMER EMULSIONS. Technical data sheets containing specifications and uses for seven acrylic copolymer emulsions for use in finishing leathers and textiles and for coating paper. American Polymer Corp. (3-812)

TETRAHYDROFURAN. Bulletin containing data on a material which is a powerful solvent for many material and synthetic resins, and which is suitable for use as a film casting solvent. 11 pages. E. I. du Pont de Nemours & Co., Inc. (3-813)

STRATA-WOOD. Recommendations for successfully machining, finishing, gluing, and polishing Strata-Wood when used for knife handles, brush backs, etc. The Formica Co. (3-814)

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UTILITY STOVE. Specifications, illustrations, features, and other important information on the gas-fired All-Purpose Pyrastove utility stove used for industrial purposes such as stock kettle warming, compound heating, etc. The G. S. Blodgett Co., Inc. (3-832)

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Potting

(*Continued from pp. 64-7*)

size achieved in these new units[5] has important esthetic appeal.

Electronic Miniaturization—Electronic miniaturization and subminiaturization projects have developed rapidly in our national defense activities.[6] In the future, the electronics engineer will find it difficult to cope with the diversified problems of subminiaturization without the help of printed electrical components and potting compounds. The circuits should be potted in compounds where electrical losses are at a minimum, such as the NBS casting resin.

High temperatures encountered in these miniaturized networks may pose serious difficulties, and sometimes hermetic sealing will have to be adopted instead of a potting mixture. Further, in the very close confines of subminiaturization, inductor distributed capacities as well as stray element capacity are increased; for example, to an extent of 2.5 with the NBS casting resin. However, the stability in humidity extremes will reduce the leakage currents if potting compounds are used. In miniaturized electronic assemblies, the tubes are encased in a resilient cushion to take up the shrinkage strains when a rigid potting compound is used. A metal chassis is employed on the exterior if shielding at radio frequencies is required. Problems of miniaturization are many, though when a satisfactory layout and design is attained, the plastic potting compounds serve to give these circuits the permanence they require.

Magneto Coils—One of the older examples of potting is a magneto coil which employs a phenolic case with molded end pieces or flanges. The air is evacuated from the case and a liquid insulating compound injected inside to protect the coil. The small opening is then sealed.

Potting compounds represent a relatively new field of endeavor for manufacturers of plastics. The wide diversity of properties possessed by plastics should make it possible to obtain almost any characteristic necessary for a successful potting operation.

[5] See also "Potted Amplifier in Hearing Aid," MODERN PLASTICS *28*, 78, (Jan. 1951).
[6] "Electronic Miniaturization," Engineering Electronics Section, NAer, 00685, Bureau of Aeronautics, Dept. of Navy, Sept. 27, 1949.

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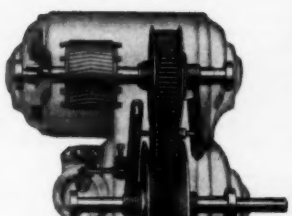

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Polyvinyl Alcohol

(*Continued from pp. 95-8*)

tion, or tanning. The bristles have proved satisfactory for tar brushes and chimney and dust brooms.

Solubility in Water

Owing to its hydroxyl groups, polyvinyl alcohol is soluble in water and hygroscopic[43]. Many important applications of PVA are attributable to these characteristics. Three-fourths of Burghausen's polyvinyl alcohol is used as an emulsifying or dispersing agent[44] in manufacturing polyvinyl acetate emulsion and polyvinyl chloride. The addition of a small amount of polyvinyl alcohol to a solution of a detergent sufficiently increases its viscosity to give it a soap-like appearance and is used in the manufacture of soap creams[45]. In a 15% aqueous solution or in a 30% aqueous paste it may be employed as a hand washing agent for motorists without water and towel. Rubbed vigorously into the hands it takes away dirt and grease[44]. Polyvinyl alcohol is used in a 2 to 3% aqueous solution as a hair setting lotion[46], and in a stronger solution as a binding agent for pigments in water colors[47], inks[48], vat dyes[49], printing pastes[50], grinding powder[51], as a stabilizing agent for colloidal solutions[52], and for coating photographic materials[53], ultra-violet absorbing films[54], and metals[55]. Its sensitiveness to humidity is used in the construction of hygrometers. Alterations in the relative humidity of the atmosphere are measured by changes in the electrical resistance of a polyvinyl alcohol filament or strip.

Stretch-oriented PVA filaments kept under tension are less water soluble than filaments which are allowed to shrink in hot water. This can be illustrated by a simple experiment. A filament loaded with a weight is immersed in a beaker of hot water. The filament is insoluble as long as it is kept under load, but as soon as the weight touches the bottom of the beaker the filament shrinks and goes into solution.

Insolubility in Organic Solvents

One of the outstanding characteristics of polyvinyl alcohol is its complete insolubility in gasoline, oil, and all organic solvents. In contrast to rubber and other plastics it does not

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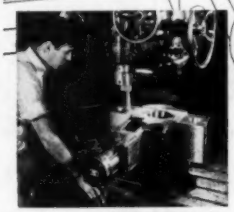

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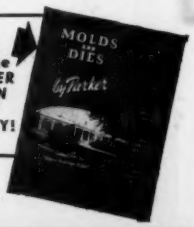

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even swell, soften, or diminish its strength after prolonged immersion. Use is made of this property in the impregnation of gasoline pump diaphragms with plasticized polyvinyl alcohol[56]. Flexible hoses for handling gasoline are manufactured by extrusion[57]. Hydrolyzed copolymers of vinyl acetate with maleic acid[58] are used in Germany under the tradename Povimal for extrusion molding operations.

Gloves[59, 60] for working with organic solvents, especially for dry cleaning, are manufactured by dipping special forms in aqueous solutions of PVA. Greater softness is obtained by using a PVA of a higher saponification number. The forms consist of normal PVC or rubber gloves placed over a wooden form of two pieces so that the form can be withdrawn from the finished PVA glove which is nonelastic. Three dips into a hot solution (about 60° C.) containing 15% PVA (SN 120) and 7% glycerol, and drying between each dip is the precedure normally employed.

Gaskets and washers resistant to gasoline and all other organic solvents are made either by cutting from PVA sheets or foils or by molding PVA powder. Plasticizer is generally glycerol or phosphoric acid. For instance, bottles filled with trichloroethylene or perchloroethylene and barrels for ethyl acetate were provided at Burghausen with caps fitted with PVA gaskets plasticized with phosphoric acid.

Gasoline tanks were made during the war for the German Air Forces (Messerschmidt) of plasticized polyvinyl alcohol sheets. They were light and bullet-proof (self-sealing). Analogous experiments with PVA mixed with polyethylene and various other plastics were described[60].

PVA films may be used as interlayer between two different plastics, such as PVC and rubber or cellulose nitrate, to prevent the migration of plasticizers.

Polarizability

Stretched PVA films show very high polarization[61]. They are used in sun glasses and have been proposed as an interlayer in windshields and in headlights of motor cars, allowing every car to be driven with full light on without blinding the drivers of the approaching cars. Carl Zeiss Co., Jena, Germany, manufactured such films during the war for periscopes of submarines to prevent dazzling effects by reflected sunlight from the sea. Several companies patented the use of PVA as interlayer for safety glass[62], but it is inferior to the polyvinyl acetal resins.

Impermeability to Gases

Polyvinyl alcohol tubes and hoses are superior to rubber and polyvinyl chloride with respect to their impermeability to gases and vapors[63], and are especially employed in laboratories for handling exact quantities of hydrogen or low boiling hydrocarbons. Other applications making use of its impermeability to air are food packing[64] and egg preservation[65]. Eggs, after being dipped into a solution of polyvinyl alcohol and dried, may be kept for a year or more. Brought into boiling water the PVA film dissolves and the egg shell does not crack, as happens with lime or sodium silicate coatings. Skins of sausages, air-tight but soluble in hot

(*Continued on p. 165*)

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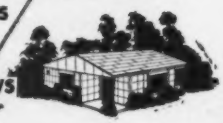

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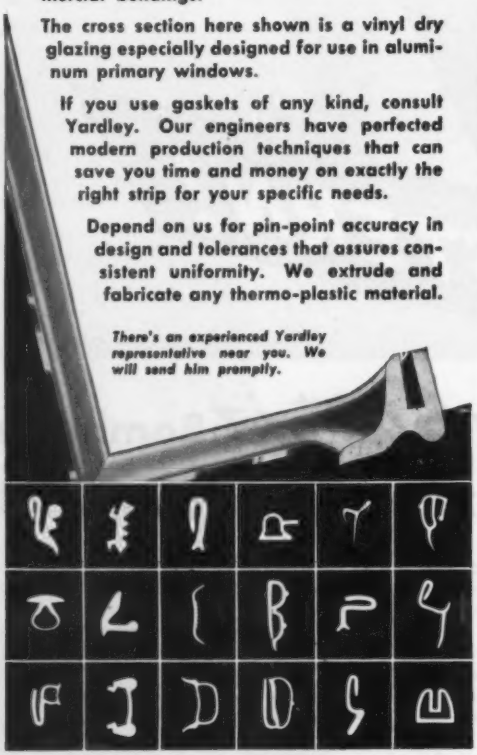

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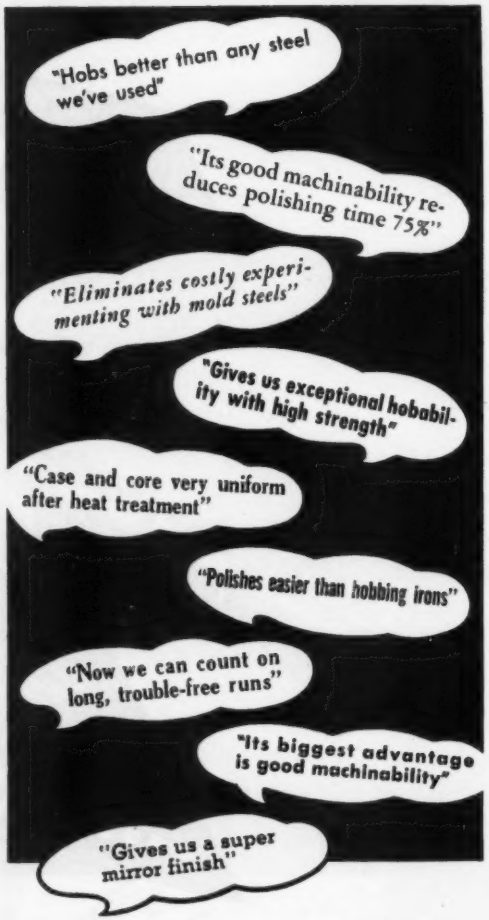
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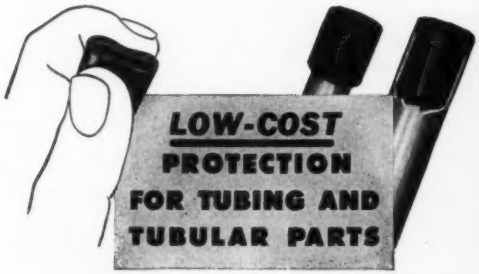

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water, and bottle caps are also made of polyvinyl alcohol[66].

Nontoxicity

Polyvinyl alcohol is completely nontoxic and can be applied for various food and medical purposes.

Food Industry—PVA (1%) added to ice cream improves the texture[67] and prevents crystallization of the water content[68]. The addition of small quantities to bread dough[69], fruit gelée[70], and beer for stabilizing the froth are other applications.

Pharmaceutical and Medical—Polyvinyl alcohol is used as a thickener in the preparation of ointments[71]. By adding 3½% of PVA to a solution of ephedrine used as a remedy against catarrh (1% ephedrine, 0.5% chlorobutanol, 0.85% sodium chloride) the viscosity can be raised to four to five times that of water at body temperature, improving the distribution of the solution upon the mucous membranes, but still leaving it mobile enough for spreading[72]. Medicaments emulsified in water by means of PVA may be used instead of alcoholic tinctures[73] for treatment of the mouth and jaw. In the preparation of hormone medicaments PVA is applied as an emulsifying agent[74]. By mixing aqueous solutions of PVA with blood-stanching agents[75], a powder of analogous qualities is obtainable.

PVA has proved to be superior to gum arabic in the preparation of hypertonic and isotonic solutions because of its higher osmotic pressure[76]. A 2.3% solution of PVA employed as a blood transfusion liquid has the same osmotic pressure as blood. In adding substances, such as Normosal or Sterofundin, artificial hydraemia caused by the latter can be prolonged. Hypertonic sodium chloride-PVA solutions[77] are applied as a dehydrating agent in post-traumatic cerebral pressure decrease with excellent results.

In the form of capsules or pills it can be used as a supporting agent of pharmaceuticals[78]. PVA has proved to be superior to pectins, agar-agar, and vegetable gelatin as a retarding agent, swelling in the intestine and slowing down the absorption of the medicament. It is claimed that absorption can be increased in mixtures with rhodanides or glucose[79], or retarded further by decreasing the solubility of PVA[80]. For the latter the medicament is added to a 6% aqueous solution of PVA and mixed with 0.2% Congo red. After a few hours gelatinization takes place, and the softening point rises to 35° C.[81]. The amount of dye added controls the solubility of the resin.

To avoid frequent injections of dissolved medicaments, such as alkaloids, cardiaca, or gland preparations, deposits of pharmaceuticals using PVA as a supporting agent are placed in the human body[78]. Plasticized (with glycerol) and unplasticized PVA films and foils are applied as supporter of plasters[82] or for the preparation of bandages[83].

Experiments have been carried out in making up solutions of PVA and insolubilizing with the pathologically inert Congo red or benzopurpurin according to the above described proportions[84] to fill cavities in the body, resulting from the collapse of lungs in the treatment of tuberculosis. It was found that these fillings are nonirritant and superior to the heterogeneous wax or stearin masses

formerly used which do not fill correctly, slip after some years, and rupture the abdominal lining. PVA masses are watery like body tissue, are held by connective tissues, and allow blood vessels and tissue to grow through them. The excellent results with lung fillings gave rise to the use of such PVA fillings for plastic stump formation, artificial eyes, bone filling, and related purposes[85-89].

A small plant for spinning sterile PVA silk, marketed under the trade name Synthofil as a surgical suture, was operated during 1936 in Dr. A. Wacker's Research Laboratory at Munich. The monofil had the same tensile strength as catgut, but a 50% higher knotting strength. A highly viscous aqueous PVA solution was kept for several hours at 130° C. for sterilizing and was spun at 130 to 140° C. and a pressure of 2100 p.s.i. To prevent infection the filament did not come into contact with the human hand or atmosphere during manufacture and packing. This synthetic suture was used in more than 300 aseptic operations[90] with good results, being nonirritating and not causing any pyrogenesis. They healed in, but were never absorbed in the tissue, although several experiments were carried out to bring about absorption[91]. The addition of medicaments to the filaments[78], as well as the coating of other surgical threads with PVA, were patented[92] but never applied.

Since PVA is resistant to microorganisms, it can be used instead of agar-agar as a base for nutrient media for bacteria[93].

Miscellaneous Applications

The use of polyvinyl alcohol in place of leather and rubber for antistatic driving belts[94], laces, hammers, mallets, couplings, matrices, cutting boards[95], and the like[96] has already been described in this magazine[9]. PVA laces are used in Germany for binding driving belts and as cord for harnesses and mattresses. Other applications for PVA include hanging straps and bell cords for street cars and busses, racks and window belts in railway cars, strings in tennis rackets, woven seat coverings, and glider tow ropes. Finally, the use of polyvinyl alcohol as rubber accelerators[97] and precipitation promotors[98] is illustrative of many other applications in chemical engineering.

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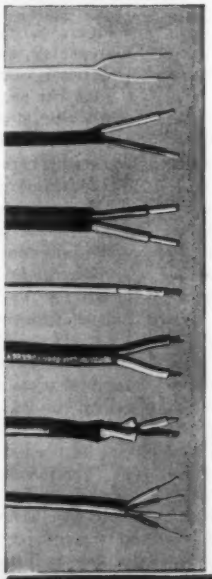

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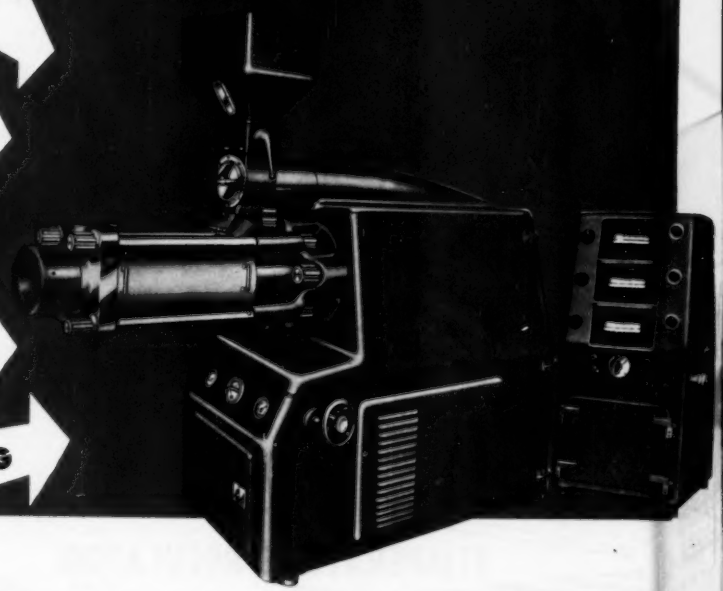

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Research and Development Board

THERE is a quietly working group about which the plastics industry has heard little but from which come decisions that frequently are of utmost importance to the type and quantity of plastics materials that may be used in the Defense Effort. This group is the Committee on Equipment and Materials of the Research and Development Board which, in turn, is an agent of the Department of Defense. This Committee is one of 15 which make up the membership of the Research and Development Board. A few of the other committees are those on aeronautics, atomic energy, biological warfare, electronics, fuels and lubricants, guided missiles, and medical sciences.

Each of these committees is divided into panels. The members of each panel study a particular "area of interest." The Committee on Equipment and Materials has nine such panels. Each one evaluates programs of research and development and coordinates the efforts of the Army, Navy, and Air Forces in each area of interest. The fields include food; clothing; rescue and survival equipment; electrical equipment other than electronic; heavy equipment and engineering construction; land transport; materials handling equipment; mechanical equipment; service equipment; fire protection; photography and optics; packaging and preservation; and organic and fibrous materials.

The chairmen of the last two panels are men well known in the plastics industry who serve without compensation, and in these two panels are studied most plastics projects in which the Research Board is interested. The panels have no less than two civilian members from industry or educational institutions and one member from each of the three Armed Service groups, but may assign task groups to work on various specific problems.

The mechanics of operation is something like this:

A panel considers the current problems of the various groups in the Armed Services—the Signal Corps, for example. Perhaps the Signal Corps wants a substitute material to make a product which is now produced from a very scarce material. The Committee's panel members will study the problem and make recommendations on paths that might lead to a solution. The Signal Corps would then go to work on it in its own research and development division or would let a development contract to a private company.

Before Korea, the government was spending over $500 million a year on research—the amount is now much, much higher. The Research and Development Board does not spend that money but coordinates the research done in the military departments. Among the other duties of the Board are those of eliminating unwarranted duplication and deciding which departments are to go ahead with each individual program. In addition, the Research and Development Board has authority to direct changes in emphasis upon existing programs and projects, including the curtailment or elimination of programs or projects which it considers of insufficient promise or relative unimportance to warrant continuation at existing levels.

Members of the industry who think they have something really hot are generally requested not to go to the Research and Development Board nor even to members of the panel engaged in any particular study. If a molder has an idea that he thinks might help the government, he should go to the branch of the Armed Services—Ordnance, Signal Corps, Bureau of Ships, and so forth—which is most likely to be concerned with his particular idea. The agency can soon tell him whether or not his idea is worth developing further. And if further experimentation or study is needed, the department concerned will take it up with the Research and Development Board or the members of the panel directly concerned.

Members of these various panels and the Secretariat of the Research and Development Board have been swamped with telephone calls and visits by industry members who were simply trying to find out what the government was going to buy. These offices and these men are in no sense procurement offices. They spend many fruitless hours patiently listening to the pleas of a man who may have molding machine capacity without any definite idea of a product to put in a machine but wants the Research Board to find that product for him. No one in the Research and Development Board or on any of the panels buys defense products—they are concerned with research and development on things that may be bought in the future, but the actual purchasing will be done by the various departments of the Armed Services where those products will be used. The Research Board or its committee membership is no place for a salesman to go—his efforts should be concentrated in the various government procurement offices.

S.P.E. Officers—1951

NEW national president of the S.P.E. for 1951 is Islyn Thomas, president of Thomas Mfg. Co., Newark, N.J. Election of officers was held during the Seventh Annual National Technical Conference in New York.

Other officers for 1951 are : Walter O. Bracken, Hercules Powder Co., Wilmington, Del., national vice president; Walter F. Oelman, vice president and general manager of Standard Molding Corp., Dayton, Ohio, national secretary; and William J. Dunnican, Synvar Corp., Wilmington, Del., national treasurer.

Melamine Dishware for QM

PROPOSED specifications and standardization for melamine dishware to be used in Army barracks were discussed at a meeting of about 70 molders and other interested persons, held in Washington

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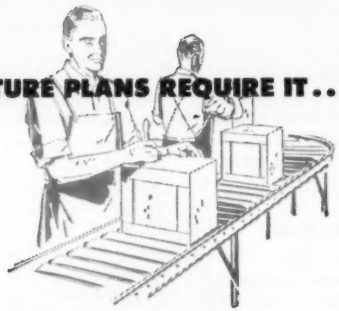

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recently under the joint auspices of the S.P.I. and the office of the Quartermaster General.

The proposed specifications for standardization were put forth in detail by Quartermaster Corps officials so that industry members might have a chance to make appropriate criticisms or suggestions. The specifications relate to design, thickness, material, packaging, test techniques, and the like. Once these specifications are okayed, it is proposed that melamine dishware for the Army will become standardized. Thus, irrespective of who may be the successful bidder, each item will be of the same quality, weight, composition, capacity, dimension, and design as that obtained on the preceding contract. No other purchases will be allowed unless there are special reasons pertaining to that particular purchase.

Plastic tableware, as designed by the Quartermaster Corps, is approximately 60% lighter in weight than china dishes now used.

The material situation pertaining to these rag-filled phenol-modified melamine dishes was discussed at some length. It was pointed out that there will be enough melamine to take care of these orders over the next two or three years without disrupting the supply of melamine for other military uses. There are some problems involved in keeping this supply in balance, and the principal difficulty seems to be a shortage of the cotton rags used for filler.

Dishes and compartment trays which are to be bought during the next few years will be procured at a gradually increasing tempo. It is understood that the annual cost for replacements due to breakage or other loss in 100 four-piece sets of tableware would be $150 for chinaware and $15 for rag-filled melamine. It is assumed that these dishes will be procured on a DO basis. It is fortunate that there is a well established and skilled dinnerware molding industry in existence which is capable of taking care of this business.

Bids for melamine-phenol dishes were let by the Quartermaster Corps last December for the Army Medical Service. It is expected that after the dishes have been standardized for the Army Ground Forces, the Air Force procurement will come in later. The Bureau of Ships in the Navy is preparing to test melamine alpha cellulose dishware.

Largest Ethylene Unit

THE world's largest single unit for manufacturing ethylene will be built at Port Arthur, Texas, by Gulf Oil Corp. The announcement followed closely Gulf's plans to manufacture nine million lb. per year of iso-octyl alcohol at additional facilities to be installed at the Port Arthur refinery. Iso-octyl alcohol, which is used extensively by the chemical industry in the manufacture of vinyl plastics, is expected to be in production by the end of this year.

The new facilities for ethylene, which will be completed by the spring of 1952, will produce nearly 2½ billion cu. ft. yearly, increasing total U.S. production of this highly important chemical component by approximately 12 percent.

New Glass-Fiber Plant

ARRANGEMENTS have been completed by Owens-Corning Fiberglas Corp., Toledo, Ohio, for building a new Fiberglas yarn manufacturing plant in Anderson, S. C. Military requirements necessitated these adjustment and expansion plans. Production is expected to begin about the middle of 1951.

Urea Resin Adhesive

THE advent of liquid adhesives that can be delivered in tank load lots has created considerable enthusiasm in furniture factories, particularly through the South. Among these comparatively new resin adhesives is BCU-22, a low viscosity, general purpose liquid urea-formaldehyde resin containing approximately 47% resin solids by weight, produced by Bakelite Div., Union Carbide and Carbon Corp.

BCU-22 is suitable for bonding plywood and furniture panels under both hot and cold pressing conditions; for bonding solid lumber in steam-heated or high frequency lumber core presses; for tapeless splicing of veneers; and for many other wood bonding applications in which a strong, permanent bond highly resistant to moisture and other adverse conditions is required. Its low viscosity and long storage life adapt it for use in bulk distribution and handling systems which offer maximum economy and convenience in handling. The commonly used fillers and extenders may be used in combination with BCU-22 to modify its use characteristics and reduce glue line costs.

When stored at temperatures of 75° F. or under, it has a storage life of approximately six months. The extender most highly recommended is 20 or more parts of wheat flour per 100 parts of BCU-22. Walnut shell flour up to 20% by weight and wood flour up to 5% are the most commonly used fillers for this adhesive.

Polyvinyl Alcohol in the War

ONE of the most satisfactory functions performed by plastics in World War II was the use of melamine, urea formaldehyde, and polyvinyl alcohol resins to help waterproof V-board which was widely used for packing cases. So efficiently did this material perform that V-board packing cases could be floated ashore from cargo carriers without damage to the contents.

In World War II something like 100,000 tons of V-board were used monthly during the height of activities. The Korean war is largely responsible for a 1950 production that grew from around 3000 tons in July to 17,000 in November. Peace time use for this paper-board box is rather limited, since its superior but higher cost qualities are not often necessary in domestic shipping.

The growing use for these boxes since the Korean war has resulted in an increased demand for polyvinyl alcohol, since several new manufacturers of V-board are using only polyvinyl alcohol. Since the demand came in the form of DO orders, other users of polyvinyl alcohol were caught short. The total consumption of polyvinyl alcohol adhesives in 1949 was only 1,300,000 pounds. Consumption in 1950 was running about 130,000 lb. a month or at a rate of about 1,600,000 lb. a

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year. In November, DO orders required about 110,000 pounds. As a result there was very little left for civilian use.

The production and end use of polyvinyl alcohol breaks down about like this, with figures based on 1949 production of 3,900,000 lb., the latest figure available: adhesives, 33%; textiles, 28%; plastics, 19%; chemicals, 11%; paper 5.5%; miscellaneous, 3.5 percent.

In addition to V-boxes, polyvinyl alcohol adhesives are used in milk cartons, wet-strength multiwall paper sacks, gypsum board, book binders' glue, and in packaging frozen foods. A sidelight of the foregoing is that the polyvinyl alcohol diversion to V-board interfered with the expanding use of paper milk cartons. Dairy men were turning to those containers in increasing numbers last fall when the caustic soda shortage cut into the production of glass milk bottles and the cleansing agents used for sterilization.

For textiles, polyvinyl alcohol is considered essential for sizing yarn for tire cord, and nylon cannot be knit unless it has been sized with polyvinyl alcohol. It has also been used for bonding unwoven textiles; in the manufacture of oil-resistant tubing; for molding gears, gaskets, etc.; in emulsification processes; and in film for some types of packaging.

NPA took notice of this heavy diversion of one material to a military product by issuing a series of directives to correct the unbalance by first diverting several tank cars of vinyl acetate monomer from which polyvinyl alcohol is produced to use in the manufacture of textiles and adhesives; second, providing a quantity of vinyl acetate monomer for the manufacture of milk cartons; third, limiting to 25,000 lb., during the month of January only, the amount of polyvinyl alcohol that could be used in the manufacture of V-board.

NPA issued a directive rather than a permanent order which is the customary method in what may be a temporary situation. A directive is easier to change from month to month than a limitation or maintenance order. The Munitions Board agreed that polyvinyl alcohol is not essential to manufacture of V-board since 75 to 80% of V-board is manufactured with urea adhesive.

The vinyl acetate supply, which is the crux of the situation, may soon clear up due to "engineering changes to expand over-all production." The directive doesn't say so, but it is believed that "engineering changes" means that Du Pont will soon come in with new equipment to replace older facilities where production of monomer was discontinued some time ago, thus leaving Carbide and Carbon as the only domestic producer in the field.

Vinyl Floor Tile

TO meet an increased demand for commercial and industrial installations of its Flor-Ever vinyl floor tile, Delaware Floor Products, Inc., 295 Fifth Ave., New York, N.Y., has developed a heavier weight vinyl tile. The new tile, which is 0.090-in. thick —in comparison to the standard 0.070-in. tile—is in the same price range as rubber tile, and is available in the same marbelized patterns as the company's standard Flor-Ever tile.

Muehlstein Memorial Award

IN honor of Julius Muehlstein, late treasurer of H. Muehlstein & Co., Inc., New York, N.Y., the company is offering an annual award to one deserving student at the University of Akron. The award specifies that the student must be one who might not otherwise be able to continue his studies and that there be no discrimination as to race, color, or creed. The total amount of the award is $10,000, to be distributed at the rate of $350 per year to the student selected.

Vinyl Over Copper

PLANTS using instrument tubing or fluid transmission lines subject to moisture or corrosive atmospheres are now being offered a new service by Samuel Moore & Co.—a coating of vinyl or polyethylene over customers' tubing by the patented Dekoron process. Tubing will be coated in the company's plant at Mantua, Ohio, before it is installed.

Numerous advantages are claimed for Dekoron tubing. The plastic sheath, which can be extruded over steel, copper, or aluminum, is chipproof and renders the metal tube virtually impervious to moisture, salt air, acids, and alkalies.

The company cites one outdoor application where sulfuric acid forms on instrument lines, and the air contains isoproponol sulfates. Ordinary steel tubing with 0.030-in. wall failed in less than a year, while Dekoron tubing made of vinyl chloride over copper is still in good condition after 2½ years of service.

Officials Elected

THE Detroit Rubber & Plastics Group recently elected the following officers for 1951: G. F. Lindner, chairman; G. R. Cuthbertson, vice chairman; G. P. Hollingsworth, secretary. The first meeting for the new year was held Feb. 16 at the Detroit Leland Hotel at which Dr. Thomas Gresham of B. F. Goodrich Chemical Co. spoke on "Polyacrylic Rubber."

A.S.T.M. Subcommittee

THE newly formed Committee D-21 on Wax Polishes and Related Materials, organized in 1950, has set forth an active research program which intends to discuss performance standards in detail. At a meeting held at the National Bureau of Standards, Washington, D. C., the A.S.T.M. elected W. W. Walton as chairman; J. V. Steinle, vice chairman; and B. S. Johnson, secretary.

Price Cut 18%

IN a world of rapidly rising prices, Rohm & Haas Co., Philadelphia, Pa., has plunged against the tide by announcing a price reduction of from 44½ to 36½¢ per lb. on methyl methacrylate monomer in carload quantities. In tank cars the price is 35¢ per pound. This is a reduction of approximately 18% on a price which has been stable for 10 years.

In addition to their use in sheets and molding powders, acrylic polymers and copolymers are used for viscosity index improvers and as pour-point depressants for lubricating oils, leather finishes, textile and paper finishes, protective coatings

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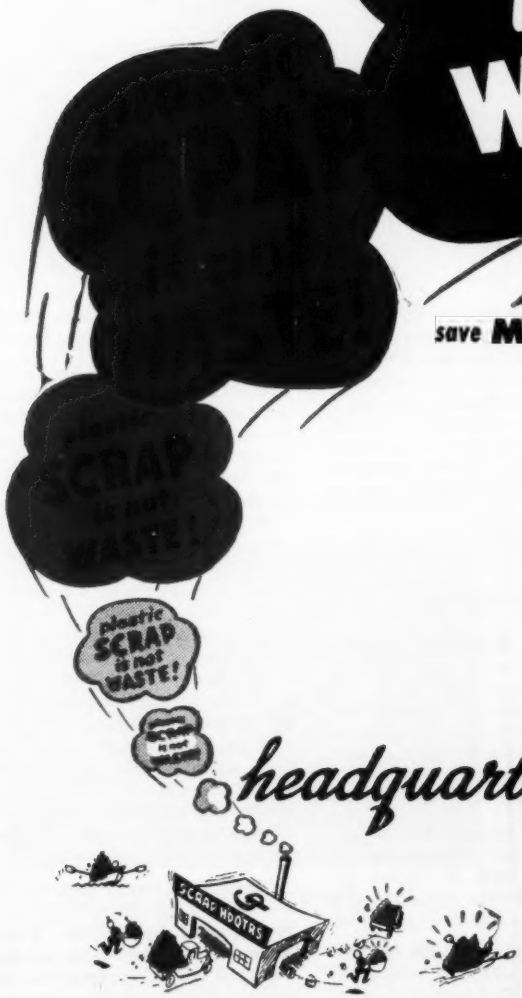

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for metals, and thickening agents for latices Company officials point out that, despite their high cost, these monomers have grown in applications where their properties offer certain advantages, and that increased usage will immediately follow this reduction in price which has been a longtime objective of the company.

The lower price has been made possible by development of more economic production methods. Company spokesmen point out that the lower cost of monomer has helped to prevent a rise in the cost of molding powder.

$4,500,000 Expansion Project

EXPANSION of the Chicago plant of The Barrett Div., Allied Chemical & Dye Corp., will greatly increase the company's present capacity for the production of phthalic anhydride, currently being manufactured at the firm's Philadelphia and Ironton, Ohio, plants. The new plant, to cost $4,500,000, is expected to be in volume production by the end of 1951. Phthalic anhydride is used in the manufacture of alkyd resin finishes as well as in plasticizers for various synthetic resins and plastics.

Improved Lacquer for Styrene

HIGH gloss, strong adhesion, and bright, long-lasting colors are the combination of properties claimed for an improved lacquer for molded styrene developed after two years of research by New England Lacquer Co., King Philip Road, East Providence, R. I. Suitable for spraying, wiping, flocking, and silk screen methods, the product is easy to apply, is available clear or in a complete range of colors, and may be obtained in various degrees of gloss. Other features claimed for the lacquer include blush-resistance, excellent coverage, and quick drying characteristics.

Thermoplastic Tubing

A CRYSTAL clear flexible plastic tubing suitable for conducting all types of solutions in a variety of applications has been announced by Munray Products, Inc., Div., Poly-Cyclo Products Co., 12500 Crossburn Ave., Cleveland 11, Ohio. The material—equally adaptable to the transfusion of blood plasma in hospitals or the transmission of hydrochloric acid in chemical plant processing—is called Cyclon Tubing and can be utilized interchangeably for pressure and vacuum operations. It is sufficiently elastic so that devices such as clamps, wires, etc., are generally unnecessary.

The tubing is claimed to have no opacity or yellowish cast and is entirely odorless. The producer says that it has been used by pharmaceutical, beverage, and dairy equipment manufacturers with no signs of contamination in the product and is unreactive to even the most sensitive medium. The interior surfaces are relatively non-wetting, which results in little or no friction loss and also facilitates cleaning. Where necessary, the tubing may be chemically or steam sterilized.

For intravenous use, Cyclon has been repeatedly autoclaved at 250° F. for 15-min. intervals. But being thermoplastic, Cyclon is not recommended for continuous exposure to corrosives at temperatures beyond 180° F. It can, however, be used with complete safety at other temperatures and, even though it becomes less flexible, there is no brittleness, nor does it exhibit any tendency toward shrinkage.

COMPANY NOTES

Claude P. Bamberger, Inc., has been formed to deal in reclaiming and reprocessing thermoplastic scrap. Claude P. Bamberger, formerly with A. Bamberger Corp., is president of the new firm which has temporary offices at 59 Carmine St., New York 14, N. Y.

American Cyanamid Co. has changed the name of its resins currently being sold as binders for foundry sand cores and dry molds from Cycor to Cyacor.

Witco Chemical Co., 295 Madison Ave., New York 17, N. Y., is reorganizing its Technical Service Dept. to provide industry with more information on critical materials during the emergency. **Dr. E. F. Wagner** is director of the department; research and development are conducted in the Chicago laboratories under the direction of **Dr. Wilbur B. Pings.**

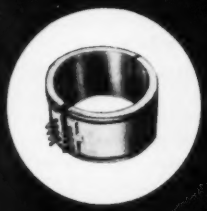
Alaka Research Div., Lacquer & Chemical Corp., 214 40th St., Brooklyn 32, N. Y., has set up facilities for the evaluation of funginertness and fungus resistance of commercial plastics. This research is being done under contract with the Bureau of Ordnance, U. S. Navy, in the field of tropicalization of materials and equipment.

Monsanto Chemical Co. has announced the following changes in personnel. **Clement R. Letarte** has been named plastics sales representative for the Plastics Div. of the Los Angeles office; **John M. Gunn** has been named assistant sales manager of the adhesives and special products section of the Western Div.; **Elmer Weil** and **Edward Kuntz** are sales representatives of a new Western Div. office at 1700 S. 2nd St., St. Louis, Mo., and will handle Rez resin-based surface coatings; **D. D. Stokes** has been named manager of adhesive and resin sales in eastern Canada for **Monsanto (Canada) Ltd.**

General Electric Co. has named **Robert L. Gibson** general manager of the **Chemical Dept.** with headquarters in Pittsfield, Mass. Formerly assistant manager of that department, Mr. Gibson has been associated with the firm since 1925.

The company has also announced other personnel changes in the Chemical Dept. **John L. Galt** is manufacturing engineer of the chemicals division phenolic products plant; **Robert J. Baumann** is marketing research section manager; **G. Stanley Berge** has been named buyer for the plastics division; **Frederick G. Weigand** is sales manager of alkyd resin products; **George S. Irby** has been appointed sales development supervisor of silicone rubber; and **Bennett H. Tollefson** is manager of sales planning and analysis for the plastics division.

Chemical Research Associates, Essex Building, Bernardsville, N. J., has been formed by **Jacobus Rinse, Auguste Rooseboom, John van der Valk,** and **John C. van Dyk.** The new group will act as chemical consult-



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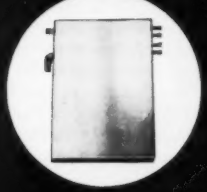

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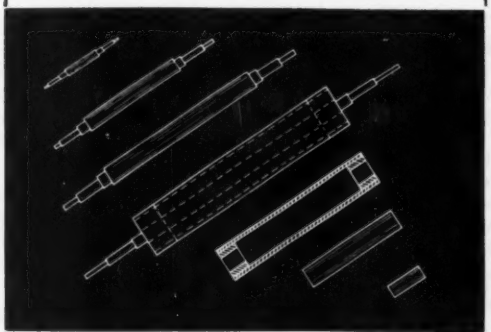

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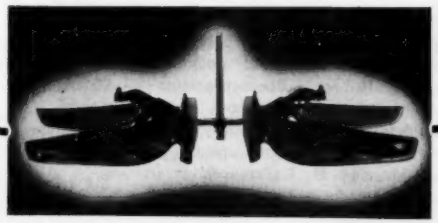

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ants and will undertake all phases of chemical development from basic research and product development to large scale process engineering.

R. S. Aries & Associates, 400 Madison Ave., New York 17, N. Y., has formed a new Statistical Engineering Div. which will specialize in the application of statistical methods to the process industries. The new department will be under the direction of **Frank M. Culpepper, Dr. David B. Hertz,** and **Dr. Sebastian B. Littauer.**

Chemical Affiliates, Inc., 274 Madison Ave., New York, N. Y., has recently been organized to trade in chemicals and pharmaceutical products and to develop new products for chemical manufacturers in this country and abroad. **Eugene Maneck,** formerly president of Brandywine Fiber Products Co., heads the new organization.

Glass Fibers, Inc., Waterville, Ohio, manufacturer of Vitron glass fibers, has moved to new quarters at 1810 Madison Ave., Toledo, Ohio.

Toscony Fabrics, Inc., 303 Fifth Ave., New York 16, N. Y., has announced the following personnel changes: **Robert H. Roemer** is manager of sales development; **Harry Stauder** is assistant secretary in charge of the foreign department; and **Marchel B. Kaczmarek** is in charge of costs and methods control for all divisions.

Synthane Corp., Oaks, Pa., has moved its New York district office from 233 Broadway, New York, N. Y. to larger quarters at 125 Parkway Rd., Bronxville, N. Y. This sales staff covers New York, New Jersey, and southern Connecticut.

Insulation & Wires, Inc., 3435 Chouteau Ave., St. Louis 3, Mo., has been appointed a distributor for **General Electric Co.'s** insulating materials.

The Plastex Corp., owned by the stockholders of **The Zimmerman Co.,** has been dissolved as a separate corporation and has become a division of the parent company to be known as **The Plastex Co.,** 402 Mt. Vernon Ave., Columbus, Ohio. It will continue the same manufacturing and selling activities with no change in personnel.

Worthington Pump & Machinery Corp., Harrison, N. J., has acquired the land, buildings, and equipment of National Transit Pump & Machine Co. in Oil City, Pa. and will use these facilities to increase its production of equipment relating to the National Defense Program.

Tumb-L-Matic, Inc., is the new name of **Lupomatic Industries, Inc.,** manufacturer of tumbling equipment under the trade name of Tumb-L-Matic. The firm is still located at 4510 Bullard Ave., New York 70, N. Y.

United States Rubber Co. has appointed **J. S. Johnson** assistant to the president succeeding **G. R. McNear; Dr. Harry Wintsch** assistant to the production manager, **Naugatuck Chemical Div.;** and **Wilbur E. Combs** product manager for the **L. H. Gilmer Division.**

Rona Plastic Corp., 1525 Blondell Ave., New York 61, N. Y., has installed a new 60-oz. HPM injection machine with a platen area of 40 by 60 inches.

United States Plywood Corp., is the Detroit area distributor of Marlite, a plastic-finished wall and ceiling panel manufactured by **Marsh Wall Products, Inc.,** Dover, Ohio.

St. Regis Paper Co., 230 Park Ave., New York 17, N. Y., has established a consolidated **Research & Development Dept.** at Deferiet, N. Y., under the direction of **Dr. Kenneth A. Arnold.** The department will perform the functions heretofore conducted separately for the firm's Printing, Publication & Converting Paper Div., Kraft Pulp & Paper Div., and Multiwall Bag Division.

The Dow Chemical Co., Midland, Mich., has announced the following promotions in its Styron plastics division: **Earl Collins** has been named assistant division superintendent; **Richard C. Smeltzer,** production superintendent of one wing; **R. E. Peterson,** director of the color laboratory; and **J. L. Williams,** director of activities in the control and inspection laboratory.

Swedlow Plastics Co., 5527-33 District Blvd., Los Angeles 22, Calif., has announced the opening of additional manufacturing and new contract administrative facilities at 3435 Malt Ave., Los Angeles 22, Calif.

PERSONAL

Van C. Carr, auditor and assistant secretary of **Adamson-United Co.,** has been transferred to the Youngstown plant of the parent company, **United Engineering & Foundry Co.** He is succeeded by **Mark M. Wolff.**

Robert Jefferson Carter has been appointed southwestern district manager for **Stone & Webster Engineering Corp.** with offices in the Esperson Building, Houston, Texas.

J. D. Stimpson has been appointed a Pliofilm packaging specialist for meats for **The Goodyear Tire & Rubber Co.,** Akron, Ohio.

Joseph A. Conlon has been appointed manager of allied sales for the **Mechanical Goods Div., United States Rubber Co. Edwin D. Meade** succeeds him as district sales manager in Chicago.

Dr. George J. Ritter has retired as a chemist at the **U. S. Forest Products Laboratory,** Madison, Wis. He joined the organization in 1920.

Raymond C. Gaugler was elected president of **American Cyanamid Co.,** succeeding the late William B. Bell. A director of the company since 1929, Mr. Gaugler has been associated with the firm since 1917.

Paul D. Holran has been transferred to Washington, D. C., by **Gering Products, Inc.,** Kenilworth, N. J., to handle his firm's business with the government.

Edwin S. Ladley has been named assistant director of purchases for **Hercules Powder Co.,** Wilmington, Del., succeeding **William L. Hewes,** who has retired.

P. W. Simmons of the New York office of **The Dow Chemical Co.** was elected president of the Newark, N. J., Section of the **Society of Plastics Engineers.**

James Wilson, formerly with Watson Stillman Co., has resigned and is

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The Carlon Products Corporation of Cleveland, Ohio, selected Kralastic for its *CARLON "L"** pipe, which has been developed for use as salt-water disposal lines in the oil fields. These pipes—which carry off the salt water that rises with oil—are buried under ground, often against sharp stones. They must be highly resistant to impact, notching, chemicals, and severe corrosive conditions.

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now president of **M & W, Inc.,** 142 Central Ave., Clark Township, Rahway, N. J. This company specializes in the production of automatic injection molding machines and in engineering development.

Dr. D. B. Keyes, a director of the company, has resigned as vice president of **Heyden Chemical Corp.,** 393 Seventh Ave., New York 1, N. Y. He will continue as a special consultant to the firm.

David White has been named president of **Lester Engineering Co.,** 2711 Church Ave., Cleveland, Ohio, manufacturer of Lester molding machines and Lester Phoenix die cast machines. Mr. White left a successful dental practice in 1940 to join Lester, and has been serving the company as vice president for several years. **David Sloane,** formerly assistant to Mr. Lester, assumes the office of vice president in charge of engineering development; and **William Schwartz** will continue in his capacity as chief engineer.

C. David Reich has joined the Synthetic Fabrics Dept. of **Reeves Brothers,** 54 Worth St., New York 13, N. Y. He was formerly associated with Burlington Mills.

Alfred F. Fukal, industrial designer and development engineer, has been elected president for the coming year of the **South Texas Chapter** of the **Society of Plastics Engineers.**

Norman F. Smith, vice president of **The Osborn Mfg. Co.,** 5401 Hamilton Ave., Cleveland, Ohio, was elected president of the company. He succeeds **Franklin G. Smith** who was elected chairman of the board.

J. Marshall Grim, formerly Senior Fellow in charge of Koppers Polymer Fellowship at the Mellon Institute, Pittsburgh, Pa., has joined the **U. S. Asbestos Div., Raybestos-Manhattan Inc.,** Manheim, Pa. Mr. Grim will head the organic chemistry section of the research and development laboratories.

Joao Muller, representative of **Omni Products Corp.** in Brazil, president of the Association of the Plastics Industry in Rio de Janeiro, and a director of the Companhia Brasileira de Plasticos "Koppers", recently spent a month in the United States studying the plastics raw material supply and plastics machinery situation in his capacity as industry advisor to the Carteira De Exportacao e Importacao, a government agency charged with the issuance of all Brazilian import licenses. Mr. Muller reports that the import situation in Brazil as far as plastics is concerned has greatly improved during the last year because of the present availability of dollars in comparison to a year ago when the Banco de Brazil restricted the use of dollars for the importation of plastics materials from the United States. While here, he discussed with Koppers officials the new styrene plant being built in Brazil.

General Hermon F. Safford has been named president and **Franklin G. Smith** has been elected chairman of **The Ohio Rubber Co.,** a leading manufacturer of finished rubber products. Within the last two years the firm has added several plastic products such as bicycle handle grips and Versibond, a decorative material for table and counter tops. The company's net sales have increased from $1,359,570 in 1933 to $22,819,342 in its last annual report. Before joining Ohio Rubber, General Safford served as works manager of the United States Army's Watervliet Arsenal in 1935 and in 1942 became chief, Production Div., Office of Chief of Ordnance.

Howard Farber has joined **The Jamison Plastics Corp.,** 71 E. Sunrise Highway, Freeport, L. I., N. Y., as manager of the Industrial Products Division.

William R. Porter has been appointed manager of the newly organized Industrial Div. of **Stewart Hartshorn Co.,** 350 Fifth Ave., New York 1, N. Y., manufacturer of window shade products. Mr. Porter was formerly director of plastics molding materials sales for Celanese Corp. of America.

Deceased

Anton Bamberger, chairman of the board of **A. Bamberger Corp.** and **American Molding Powder & Chemical Corp.,** 703 Bedford Ave., Brooklyn, N. Y., died at the age of 64. During World War II, Mr. Bamberger served as an advisor for the Plastics Industry for the War Production Board.

D. Gray Maxwell, for many years New York manager of **Waterbury Companies, Inc.,** Waterbury, Conn., died recently after a long illness.

MEETINGS

Feb. 28-Mar. 2—Reinforced Plastics Div. Meeting, 6th Annual Technical Session, The Society of the Plastics Industry, Edgewater Beach Hotel, Chicago, Ill.

Mar. 5-6—Annual Meeting, The Society of the Plastics Industry (Canada) Inc., Mount Royal Hotel, Montreal, Quebec.

Mar. 5-9—American Society for Testing Materials, Spring Meeting, Cincinnati, Ohio.

Mar. 13-16—National Association of Corrosion Engineers, 1951 Conference and Exhibition, Hotel Statler, New York, N. Y.

Mar. 25—Worcester-Leominster Chapter Meeting, The Society of the Plastics Industry, Sterling Inn, Sterling, Mass.

Apr. 16—Semi-Annual Meeting, The Packaging Machinery Manufacturers Institute, Hotel Dennis, Atlantic City, N. J.

Apr. 17-20—American Management Association, 20th National Packaging Exposition, Auditorium, Atlantic City, N. J.

May 24-25—The Society of the Plastics Industry, Annual Meeting, Greenbriar Hotel, White Sulphur Springs, W. Va.

S. P. E. Meetings

Mar. 12—Upper Midwest Section of S.P.E. at Esslingers' Cafe, 1927 University Ave., St. Paul, Minn. Dr. W. J. Clayton, Minnesota Mining & Mfg. Co., Detroit, Mich., will talk on "Industrial Adhesives."

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all colors ***all flows***

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We follow through with

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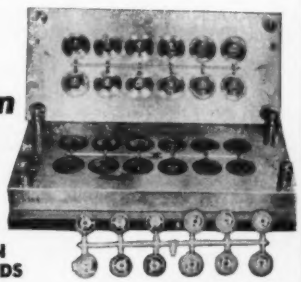

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100 T. FARREL Self Cont. 13" Str.	1,950.
75 T. STANDARD '40 Vert & Horiz.	1,975.
75 T. D. & Boschert 8" St. 16" pl.	800.
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MISCELLANEOUS

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WANTED: PLASTIC Scrap or Rejects in any form. Acetate Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted, surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 853, Modern Plastics.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic and Ethyl Cellulose. Reply Box 854, Modern Plastics.

WANTED: Plastic Scrap & Rejects in any form, such as Cellulose Acetate, Butyrate, Polystyrene, Soft & Rigid Vinyls, Polyethylene, Lucite & Plexiglas scrap and offcuts. Claude P. Bamberger, Inc., 59 Carmine St., New York 14, N.Y. Tel: CHelsea 2-1241.

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WANTED: Your Scrap Vinyl, Polyethylene, Polystyrene, Acetate, Ethyl Cellulose, and etc. OFFERING: Reprocessed Granulated Plastic, Custom Grinding, and Straining. Reply Industrial Plastic & Textile Company, 73 Wesley Street, Irvington, N. J.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 5-7943.

(*Continued on page* 186)

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(*Continued from page 184*)

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VARNISH SALESMAN WANTED: Opportunity with a future offered by substantial established eastern manufacturer for young experienced aggressive salesman who knows trade. Our own men know of this offer. State complete personal, education and experience background, with salary requirements. Reply Box 858, Modern Plastics.

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WANTED: Experienced plastics production man to take charge of new plastics division in small company, a leader in its field, located in Western Pennsylvania. Unusual opportunity. Reply Box 868, Modern Plastics, giving qualifications.

Vinyl Film and Sheeting Calender man. A thoroughly experienced man who is capable of taking charge of plant producing heavier gauge materials. This is an excellent job for a man who is capable and experienced in quality production. Associated Rubber & Plastic Corp., 2780 Park Avenue, Bronx 51, New York.

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PLASTIC EXECUTIVE AND ENGINEER. Ten years experience in the plastic field. Injection, compression, transfer, and low pressure polyester molding and laminating. Experienced in supervision-Executive department head. Product design, tool design, sales service, production, and wide experience in development. Have written technical articles and hold plastic patents. Desires position in Midwest. Chemical Engineer, age 34. Excellent references. Reply Box 869, Modern Plastics.

PLASTIC CHEMIST: Member of the Society of Plastics Engineers, expert in separating contaminated ground and other plastic materials. Several years working for large Plastic Scrap Company. Reply Box 872, Modern Plastics.

PLASTICS ENGINEER desires responsible position with progressive molder or end user of plastic material. Extensive experience in all phases of Thermosetting materials. Experienced in high and low pressure laminating and Thermoplastic materials. Supervisory experience. Married. Locate New England or upper New York State. Reply Box 877, Modern Plastics.

PLASTIC ENGINEER: Ch. E. Injection, compression, transfer. Product design, mold design and procurement. Familiar with molding equipment of all kinds. Message, training, layout. Development production or project engineering. Presently in charge of mold design. Experience: 15 years engineering, of which 5 years molding, 3 years die casting. Reply Box 879 Modern Plastics.

MISCELLANEOUS

MOLDS WANTED: Important French firm seeks to buy or lease on royalty basis American molds for toys, stationery, electrical appliances, kitchen utensils, bottles packaging and other new devices for 3, 4 and 6 Oz. injection press. Reply Box 864, Modern Plastics.

From scrap and learning in doing it, have become the leading Hearing Aid business and Audiometrist, with many firsts. Have two large sales Offices and organizations in the very best and most central Paris locations, with laboratories, assembling and repair shops. Am manufacturing acrylic custom earmolds by compression and small plastic parts and molded cord ends by injection. Would welcome information, literature and quotations on modern equipment in the above lines and on small or bench type mechanical injection presses. Would also consider propositions of any firsts, preferably connected to Hearing Aid accessories or medical, small plastic parts hard to manufacture, custom made or needed in small series, just what anyone else usually turns down. Local manufacture only, on account of currency and custom difficulties and in view of spreading and exporting to the soft currency markets. Partnership if I can contact someone willing to visit or stay. Start could be conducted at once from existing facilities for an entirely separate business. A 1 references U.S. or France. Jean A. Toulemonde 57, Boulevard Haussmann, Paris, France.

TOY MOLDS FOR SALE: Suitable for 6 or 8 oz. injection machine. One 32 cavity medal mold and one 12 cavity toy airplane mold. Ideal as premium items. In excellent condition. Will sacrifice. The B. Gordon Press, 265 Canal Street, New York 13, N. Y. Canal 6-1070.

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LINES WANTED: New York sales representative, covering major 5¢ to $1.00 Chain Stores, desires to contact stock molders of plastic items, housewares, toys, notions, novelties, etc. Have over 20 years' experience in marketing plastic items to the big Syndicates, and can produce volume sales. Quick action; commission basis. Box 857, Modern Plastics.

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WANTED USED MOLDS: In good condition for a soap box and a thin barber comb, for an 8 oz. Reed-Prentice machine. Reply with one sample to Box 876, Modern Plastics.

FOR SALE: Complete set of Toy Molds for freight train, soap box, Heart shape candy container for export only. Reply Box 878, Modern Plastics.

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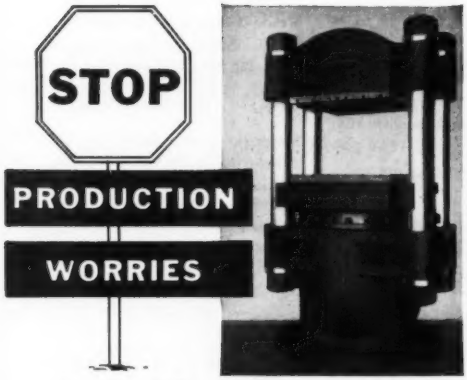

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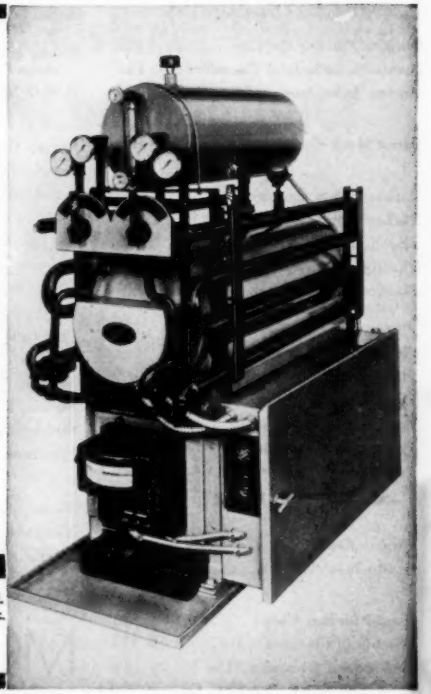

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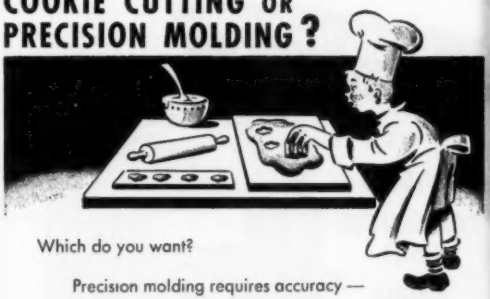

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Precision molding requires accuracy — experience — engineering — high technical skill — complete "know how" to design your piece, work out your problems, produce your piece to your complete satisfaction.

On the other hand, cookie cutting — well!

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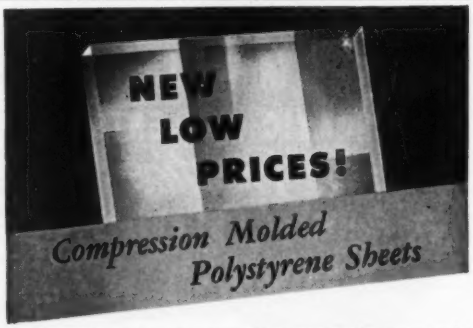

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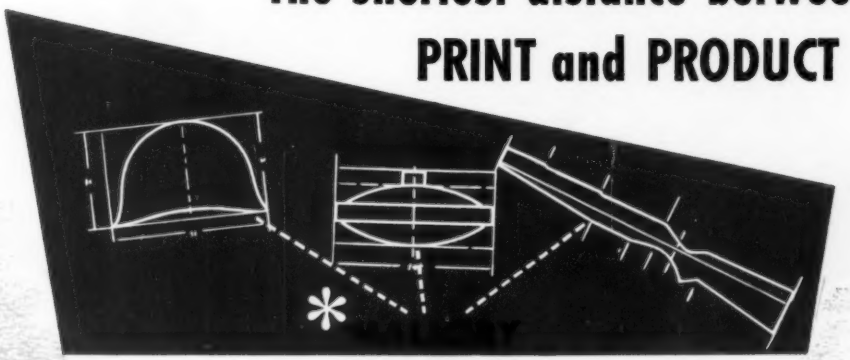

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- Low Loss Factor
- High Resistivity
- Dimensional Stability
- Low Water Absorption

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The BAKELITE line of plastics contains a group of Phenolic materials developed expressly for difficult electrical insulating jobs. These superior materials offer custom molders and product designers the needed properties, electrical and mechanical, for communications equipment, marine electrical parts, and automotive applications.

RANGES OF VALUES FROM ELECTRICAL TESTS

Dielectric Strength (D149-44)	
S/T ⅛", volts/mil	300-400
Dielectric Strength (D149-44)	
S/S ⅛", volts/mil	250-350
Volume Resistivity	
(D257-46), meg.-cms.	10^6-10^8
Dielectric Constant (D150-47T)	
60 cycles	4.8-6.5
1,000 cycles	4.6-5.5
1,000,000 cycles	4.5-5.2
Power Factor (D150-47T)	
60 cycles	0.01-0.07
1,000 cycles	0.006-0.05
1,000,000 cycles	0.005-0.02
Loss Factor (D150-47T)	
60 cycles	0.05-0.46
1,000 cycles	0.03-0.28
1,000,000 cycles	0.02-0.10

RANGES OF VALUES FROM MECHANICAL TESTS

Compressive Strength (D695-44), 15,000 to 24,000 psi. **Tensile Strength** (D651-48) (⅛"), 5,000 to 7,000 psi. **Flexural Strength** (D790-45T), 9,000 to 12,000 psi. **Modulus of Elasticity in Flexure** (D790-45T), 25-35 x 10^5 psi.

RANGES OF VALUES FROM MISCELLANEOUS TESTS

Other property ranges of BAKELITE "Low Loss" Phenolics are as follows: Molded specific gravity, 1.66 to 1.92; thermal coefficient of expansion, linear per deg. C. (D696-44), 2 x 10^{-5}; heat distortion temperature (D648-45T), 230-350 deg. F.; water absorption (D570-42), per cent gain in weight, 0.01-0.07.

Address inquiries to Dept. BR-13.

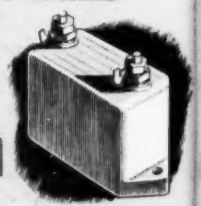
BM—262 NATURAL "LOW LOSS" MATERIAL

Properly molded, it is the top quality low-loss phenolic. Requires greater care in molding than other low-loss materials. Supplied on a "made to order" basis at slightly higher cost than the other materials.

Typical uses: Parts for radio receivers and amplifiers, electronic condensers, audio oscillators, signal generators.

Recommended to molders and manufacturers desiring approval under MIL-P-14A

BM—16981 NATURAL "LOW LOSS" MATERIAL



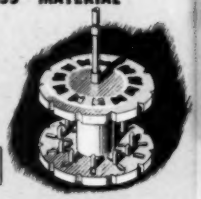
Has exceptionally good electrical properties which are retained under moist service conditions. Easier to mold than BM-262, and somewhat lower in cost.

Typical uses: Electronic capacitors, resistors, and parts for radio, radar, X-ray and similar equipment.

Recommended to molders and manufacturers desiring approval under MIL-P-14A

The black counterpart of this material is BM-17080.

BM—17748 NATURAL "LOW LOSS" MATERIAL



Has greater moldability than either BM-16981 or BM-262. Good electrical properties under moist service conditions. More stable dimensionally than most phenolic molding materials.

Typical uses: Coil forms, vacuum tube bases, condenser housings and resistors.

Recommended to molders and manufacturers desiring approval under MIL-P-14A

BM—13017 NATURAL "LOW LOSS" MATERIAL

Has greatest moldability of all materials in the "low loss" group. Has excellent electrical insulating properties in general, although not intended for high frequency service. Highly resistant to moisture. Dimensionally stable.

Typical uses: For less exacting electrical service such as automotive ignition parts and various types of resistors.

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Phenolic PLASTICS

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Union Carbide and Carbon Corporation
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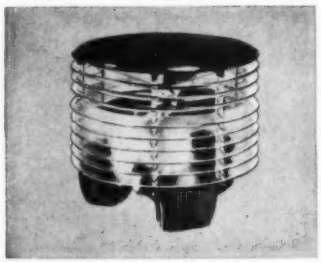
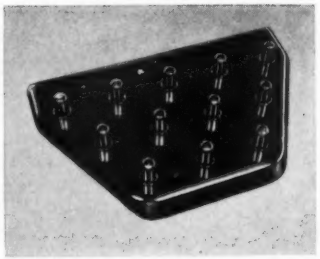
How SHOCK-RESISTANT G-E rubber-phenolics *benefit industries like these*

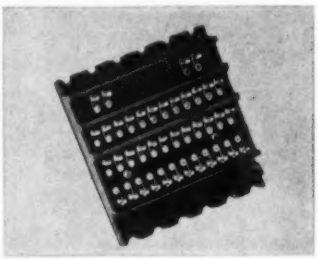


Appliance—Shock-resistant parts can be made of G-E rubber-phenolics by low-cost, hi-speed molding and finishing operations.

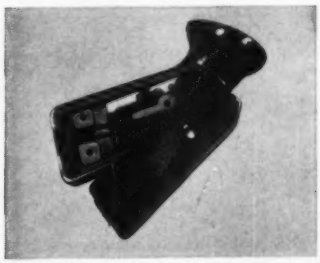


Industrial Equipment—G-E rubber-phenolics offer additional safety factor because they often remain operative after cracking.

Wiring Devices—Breakage of fragile parts during shipping or assembling is minimized with shock-resistant G-E rubber-phenolics.



Business Machines—Cracking is minimized around inserts molded or press-fitted in thin-walled parts by using G-E rubber-phenolics.



Electrical—Tough G-E wood flour-filled rubber-phenolic parts may be made in molds designed for general-purpose compounds.

Textile Equipment—The outstanding shock, vibration and fatigue resistance of G-E rubber-phenolics mean parts that can "take it."

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Why not check your jobs requiring shock resistance and see if the new G-E rubber-phenolics will do the job better or at lower cost? Remember, you can choose from wood flour-, asbestos-, flock- or fabric-filled types to get the impact strength and heat resistance you need.

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